NATIONAL FOUNDATION FOR EDUCATIONAL RESEARCH
IN ENGLAND AND WALES

Publication No. 4.

THE EDUCABILITY OF CEREBRAL PALSIED CHILDREN

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BY

M. I. DUNSDON, M.A., F.B.Ps.S.

with a foreword by

THE RIGHT HONOURABLE GEORGE TOMLINSON, M.P.
Minister of Education

Published for the Foundation by

NEWNES EDUCATIONAL PUBLISHING CO., LTD.
TOWER HOUSE, SOUTHAMPTON STREET, STRAND, LONDON, W.C.2

NATIONAL FOUNDATION FOR EDUCATIONAL RESEARCH
IN ENGLAND AND WALES
79 WIMPOLE STREET, LONDON, W.1

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FOREWORD

by

The Rt. Hon. GEORGE TOMLINSON, M.P.

Minister of Education

In 1945 the Advisory Committee on Handicapped Children advised my predecessor " that there was an urgent need for the setting up of a small but definite scheme for research into the medical and educational aspects of the problem of children suffering from cerebral palsy ; that it was the Committee's considered opinion that this was fundamentally an educational problem ; that the research should be controlled by the Ministry of Education and that an essential part of the scheme was that a first-class expert in educational research should be put in charge of the experiment."

It was decided to ask the National Foundation for Educational Research in England and Wales to assume responsibility for this, and early in 1946 Miss M. I. Dunsdon was appointed by the Foundation. I am, therefore, very glad to have the opportunity of writing a foreword to this book, in which are published the results of three years' research.

Miss Dunsdon's research has been directed to aspects of cerebral palsy which affect the educability of children suffering from this handicap. The resulting survey gives a picture of the whole field which has been unobtainable so far in any one published work and which both increases our knowledge of certain aspects and indicates many lines along which further research might usefully be undertaken.

I am sure that it will be of great value to all parents, doctors, teachers, therapists, psychologists and administrators who are in any way concerned with the care and education of children suffering from cerebral palsy.

August, 1951.

PREFACE

In publishing this report of an investigation into the educability of cerebral palsied children, the Foundation believes that the material it contains will be of considerable service to all those who are concerned with the various aspects of this complex and highly specialised educational problem. Miss Dunsdon's research is a pioneer one in its field and should be regarded as a contribution to an important area of concern in the larger field of the care and education of the handicapped child.

Originally the inquiry was intended to be focused on the question of the education of children handicapped by " Spastic Paralysis and Allied Conditions." As it developed, however, it became an investigation into some aspects of cerebral palsy affecting the educability of children suffering from this handicap. In assessing the importance of work of this kind, and in relating it to general progress in its field, it is necessary to realise the extent to which research on these problems has hitherto been limited by the paucity of facilities for the educational care of children suffering from these conditions. At the time when this research was initiated, there existed no schools exclusively for cerebral palsied children. Now, nearly six years later, four such schools are in operation in England under voluntary auspices and three further residential schools are in the course of preparation. In addition several Local Education Authorities have established units for cerebral palsied children in schools for the physically handicapped

The extent to which many cerebral palsied children are able to profit from the educational schemes already established for handicapped children is limited by various factors. It was clear in the beginning that much preliminary investigation would be needed if experiments were to be planned with a full knowledge of the part played by these factors. For example, estimates of the incidence of cerebral palsied children in this country, let alone the proportion who might be educable to any useful degree, were found to be subject largely to guess-work, or else, being based on evidence from elsewhere, were not necessarily applicable to this country. In the event, this research had to be limited to a survey of the educational problems presented by cerebral palsied children in the light of an examination of the general and specific nature of their handicap. At one time it was hoped to be able to proceed further to a strictly experimental inquiry into the relative merits of different educational methods. This aim, however, had to be renounced, but it is hoped that the report of Miss Dunsdon's work may stimulate others to undertake the necessary further investigations.

The Foundation would like to take this opportunity of expressing its great indebtedness to all those who have helped to further the progress of this investigation. The author in her own acknowledgements has felt moved to record her indebtedness in some detail, but the Foundation wishes this expression of its own gratitude to be general and hopes that it will be accepted by all those, whether in schools or elsewhere, who made a contribution to the work.

Mention should also be made of Miss Dunsdon's visit to the United States of America, from which experience a fresh perspective was gained.

In this place also the Foundation would like to record its special gratitude to the British Council for the Welfare of Spastics for their advice and encouragement throughout this investigation, and for financial assistance with the expenses of the publication of this report.

It must be clearly understood that for the material presented in this report the author is alone responsible, and that neither the Foundation nor the British Council for the Welfare of Spastics is necessarily in agreement with all the findings. They wish, however, to recommend Miss Dunsdon's work to all who may be interested in its particular problem as a thoroughly responsible piece of scientific research, likely to mark the beginning of fresh advances in the welfare of those children with which it is concerned.

G. B. JEFFERY,
Chairman of the Executive Committee.

BEN S. MORRIS,
Director.

November, 1951.

AUTHOR'S ACKNOWLEDGEMENTS

I would like to take this opportunity of expressing thanks to several local authorities and individual members of their staffs who so willingly co-operated in the task of obtaining both information about the problem in general in their own areas as well as details of individual children. In this respect I am particularly grateful to the education officers, psychologists and school medical officers in Bristol, Cumberland, Leeds, Liverpool, Northampton, Northamptonshire, Oxford and Oxfordshire. Thanks are also due to the British Council for the Welfare of Spastics for permission to use information obtained by their Educational Advisory Committee from a number of other local authorities.

Last, but not least, thanks are due to the managers and staff, both educational and medical, of two special schools, St. Margaret's School for Spastic Children, Croydon, and Moor House School, Oxted; the latter for giving much appreciated opportunities for studying certain problems connected with hearing defects and for the loan of a Maico audiometer, and the former for opportunities to collect necessary details from histories and individual examinations of large numbers of cerebral palsied children who were seen at the school, as well as for opportunities to investigate in greater detail some of the problems presented by those who were accepted as pupils.

Acknowledgements are made to the following for permission to reproduce copyright material: The World Book Co., New York, for figures quoted in Table XXVII from Rachel Stutsman's *Mental Measurement of Pre-School Children*; Professor Quinn McNemar of Stanford University, for figures relating to normal children (Tables XXI, XXII, XXIII, XXVI) quoted from *The Revision of the Stanford Binet Scale* (Publisher—Houghton Mifflin, 1942); The American Orthopsychiatric Association and Dr. Lauretta Bender for permission to reproduce (plate I) the test figures from Dr. Bender's Visuo-motor Gestalt test; and to Amplivox Ltd. for permission to reproduce their Audiometer Record Cards.

M. I. DUNSDON.

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CHAPTER I

INTRODUCTION

(a) General attitude to educational needs of special groups ; (b) Terminology ; (c) Purpose of present research ; (d) Scope of inquiry ; (e) Theoretical considerations ; (f) Recommendations and conclusions ; (g) Plan of work.

(*a*) The idea of adapting educational provision and methods to the specific needs of the child, rather than the child to the limitations of existing methods and provisions, reflects an attitude of mind which has found general acceptance only within approximately the past 30 years. Particular inquiry into the needs of children with specific difficulties has been a matter which, though recognized as necessary, until rather later tended to receive less attention than the problem of the differing needs shown among groups of " normal " children. This is understandable inasmuch as handicapped children represent, fortunately, only a small proportion of the total child population and, in addition, within themselves, show such wide differences in the extent and variety of their needs that, except possibly among the larger local authorities, to make special provision appropriate to every individual case would have proved of extreme practical difficulty.

(*b*) *Terminology*. The specific difficulties of children handicapped by those syndromes of neurological origin which are most obviously recognized by a characteristic lack of motor co-ordination, but which also include among their symptoms concomitant defects of hearing, speech, vision and intellect, have been among the last to receive attention. This is not to say that they have been entirely excluded from the existing educational schemes. To suggest that this was the case would be grossly unfair to those who, in the past, have devoted untold patience and ingenuity to attempts to adapt existing provision to the needs of those who were not too severely handicapped to be able to attend either day or residential schools and centres already established. Many of these children with motor disabilities have, in fact, profited to a surprising degree from the provision available at schools for physically handicapped children provided both by local authorities and voluntary bodies. Others, whose handicap included a not too marked degree of intellectual impairment, have profited no less from attendance at schools for the educationally subnormal. Children who have been able to profit in this way have included, however, only a proportion of the total number of children handicapped by conditions which at various times have been included under the term " spastic paralysis." This term has, in fact, been applied nor only to the spastic diplegias, quadriplegias, hemiplegias and paraplegias, but also to those not exhibiting actual " spasticity " but athetoid movements, ataxia and various forms of rigidity and tremor.

During the past ten years in which medical interest in these conditions has received an impetus from the intensive work of a few individuals —notably Phelps,[57] Carlson [10] and Perlstein [56]—in America, and others later in this country and elsewhere in the world, it has become apparent that the term " spastic paralysis " is a misnomer when applied to the conditions of many of these children, since their motor disability does not arise from " paralysed " musculature. The term is also misleading when extended to other conditions in which the inco-ordination is seen not in lack of movement but rather in an inability to control unwanted movements that interfere with intention. In recent years, therefore, the generic term " cerebral palsy " has been gradually receiving more general acceptance as more accurately applicable to these types of motor handicap which arise, mainly before or during birth, from a lesion in, or maldevelopment of the brain, or from some other cause referable to the central nervous system.

(*c*) *Purpose of present research.* The main purpose of the present research was to study the abilities and disabilities of cerebral palsied children, in order that facts, rather than assumptions and impressions only, should provide a sound basis for the establishment of appropriate schemes for their educational care.

First it was necessary to obtain a more precise estimate than was then available of the general incidence of cerebral palsy among children. Secondly, since different forms of the handicap each impose characteristic physical restrictions, we needed to know what proportion of these children could be classified within each of certain broad types. Thirdly, it was important to know approximately the proportion and number of these children who were so handicapped that their participation in existing educational schemes was restricted or precluded. Fourthly, we needed to study the general effects of cerebral palsy on intellectual growth and the development of abilities, and then to make more detailed studies of certain factors which appeared to have a special bearing on learning and school progress. Fifthly, in the light of our findings, we proposed to consider suitable forms of special education which would meet the needs of cerebral palsied children for whom there was no existing provision.

(*d*) *Scope of Inquiry.* Reference to the above broad objectives of the research should give some indication of the scope of the present study.

Previous literature available on the subject of cerebral palsy has, with few exceptions, been concerned with the physical and neurological aspects of the disorder and with matters concerning the general care and training of children with this handicap. Many of the references are relatively brief and in some cases incidental only to discussions of wider problems and other associated conditions (e.g. Doll, Phelps and Melcher [16]: "Mental Deficiency due to Birth Injuries"). One American study based on a more intensive investigation (McIntire [44]: "Incidence of Feeble-Mindedness in the Cerebral Palsied") refers only to a specific aspect of the problem. With the exception of E. Evans Lord's [40]: "Children Handicapped by Cerebral Palsy" no study of the educational difficulties of these children has been published. Even in Dr. Lord's valuable study detailed investigation of capacity for learning and educational progress was limited to a small group of 12 children, though many interesting facts emerged from general observation of larger numbers seen in the course of some years.

Apart from these American studies, however, there is a noticeable absence of literature on the subject of cerebral palsied children's aptitudes and disabilities in relation to education. Other publications have, for the most part, taken the form of popular articles written largely for their emotional appeal to the general public.

The total number of children included in the present research was just over 3,700, of whom about 1,900 were boys and 1,800 girls. The age range was from birth to the end of the sixteenth year. It was not possible to investigate all of these in detail, since the organization and practical work of the inquiry devolved almost entirely upon one person and time was limited.

Through the kind offices of the British Council for the Welfare of Spastics, much useful information was obtained from replies to a questionnaire sent out by the Educational Advisory Committee of that organization to local authorities.

In the present research use has been made of data from 104 of these authorities concerning the incidence, age, sex and type of handicap of cerebral palsied children in their areas.

Ten local education authorities, selected as providing typical examples of urban, rural, industrial and residential districts, were invited to co-operate more closely by allowing detailed investigations to be made.

In addition to the work carried out in these areas, several schools for handicapped children were visited with the object of seeing how far the general organization could cater for cerebral palsied children and of obtaining information about individual pupils.

Among these schools, one day school and three residential schools in particular were helpful in providing opportunities for more detailed study of individuals.

Individual case histories were obtained in 1,044 cases. The data required for these were collected from various sources including parents, doctors, schools, hospitals and social agencies. In some instances the necessary information had to be obtained by correspondence but, where possible, personal contact was made with those who could give the needed information.

In 916 cases, individual assessments were made of abilities, aptitudes and attainments. In all but a few instances this work was carried out by the research worker personally so that, as far as was possible, standards of assessment and grading could be kept constant.

In approximately half of the above cases the children were candidates for one particular special school intended exclusively for children with cerebral palsy. At this school it was the privilege of the research worker to form one of a diagnostic team. The opportunity thus afforded of being present at physical and neurological examinations and at parent interviews provided an invaluable means of collecting much of the data required about early development and effects of specific disabilities on previous progress. The range of the investigation covers four main aspects of the problem, viz.: psychological, educational, administrative and theoretical, though not all in equal detail.

The object of the psychological enquiries was to obtain information about cerebral palsied children's abilities both intellectual and social; to get some idea of those avenues along which their development had been retarded by reason of their handicap, and of those along which progress had been unimpeded and to see, if possible, what factors were operative in helping a child to make the fullest use of his abilities despite such handicaps as his condition imposed.

The importance of obtaining developmental histories as detailed as possible will be obvious, since the degree to which a child was making use of his abilities needed to be assessed in the light of such matters as the age at which he was first able to sit, walk and speak, or to communicate his needs by other means, and the effect of any concomitant sensory disabilities on his efforts towards independence.

In the case of most of these children who were applicants for a special school, the gathering of the needed information was possible when parents brought their children for diagnostic examination, but in some cases it was necessary or preferable to visit children in their own homes. There were often advantages in making these visits a preliminary to attendance at an examination at the school since it was possible to see how children behaved in the familiar home surroundings and to get some ideas of the opportunities which were afforded them there. Parents, too, often felt able to discuss both their own and their children's difficulties more freely and tended less often to withhold information which, at a more formal interview, they sometimes feared to give, lest it adversely affect their children's chances of admission to special education. Home visits, too, gave many parents an opportunity to discuss the repercussions of their handicapped child's disabilities and difficulties on other members of the family. Many also took advantage of a personal visit both to voice, and to have allayed, what was often a long standing and suppressed sense of guilt which had resulted in an over compensatory protective attitude which, in turn, was found to be having a persistently retarding effect on their children's progress. The research worker's previous experience in child guidance was of considerable help in such situations where emotional difficulties were aggravating those which already existed by reason of the physical aspects of the handicap.

In more obvious practical ways too, home visits were of value to parents whose children proved too handicapped to be suitable for the special school to which they were seeking admission. It was often possible to make suggestions about the provision of simple aids which could in some measure lighten the domestic burden borne by the mother. Such suggestions included inexpensive modifications of ordinary chairs, so as to give the needed extra support, of spoons so as to afford a safer grip, of trays so that plates would not be upset, and of toilet seats from which children would not fall.

In the case of all children, attempts were made, through both verbal and non-verbal means, to assess their comprehension, reasoning power, memory and initiative, all important factors in learning.

For this purpose standardized scales of intelligence were used as well as other material. The scale most generally useful was found to be the Terman Merrill Revision of the Stanford Binet Scale.[72] In addition, however, many children were given Progressive Matrices, Merrill Palmer Pre-School Scale, Séquin and Healy Form Boards, Koh's Block Design, Cube Construction and a test of Gestalt appreciation.[2]

The time needed for individual assessment varied greatly. Age of child, type and degree of handicap, fatiguability, personality, temperament and social adaptation were all factors which influenced the time required. The average time taken to obtain an estimate of general intellectual capacity was from 1½–2 hours for each of over 900 children for whom individual assessments were made. In those cases, however, in which frequent rests were necessary, or in which there was a wide scatter of ability levels, or in which it was necessary to supplement the basic tests by others, the total time expended was as much as 6–7 hours. In the case of a group of 35 children to whom the Bender Test of Visual Gestalt Maturation[2] was given, a further 1–2 hours was needed for each child. Perhaps the most time-consuming of all the techniques employed was the testing of 27 children by pure tone audiometer. In all cases these children had speech defects as well as, in most cases, an unsuspected degree of hearing loss. Because of this the process of accustoming them to the test procedure and discovering the optimum periods during which they could listen with concentration to very small sounds was a lengthy preliminary to the actual tests. Both preliminary practice and the actual test recording periods varied greatly, in accordance with age, intelligence and stability, but the average time required was about three hours.

The testing of laterality was attempted in many more than the 264 cases to whom reference is made in the text. The ratio of right and left dominance was, however, based only on results obtained from children who had sufficient use of both hands to make preference a practical possibility and from those whose dominance, by observation and repeated testing, appeared consistent.

Assessments of attainments in reading and arithmetic were able to be made in relatively few cases. Even among those children who were candidates for a special school for cerebral palsied children the large majority had made no beginning in these skills. In the case of children seen elsewhere, the position was much the same, except for those who were not too handicapped to attend an ordinary or a special school for physically handicapped children. Since the main object of the research was to inquire into the educability of those children with cerebral palsy who were unable to take advantage of existing educational schemes, the study of educational progress was limited to those children who were admitted to a special school for cerebral palsied children as likely to be educable if given an opportunity of receiving a greater amount of individual attention than would be possible elsewhere.

In considering the type of special educational scheme which might advisedly be established exclusively for the more severely handicapped cerebral palsied children, the results and implications of the psychological and educational inquiries had clearly to be borne in mind. Many of the facts which emerged and many of the indications were, in some respects, unpalatable to those whose sympathies for such children tended to mask their intellectual awareness that certain limits to progress would inevitably be set by the nature of the handicap in itself. These limits, however, could not be ignored in proposing schemes which would be based on observed fact rather than on wishful thinking. Schemes intended to cater for a majority cannot be based only on the needs and prospects of a small minority of atypical individuals. The needs of such exceptional cases need not, however, be ignored and it is for this reason that a certain fluidity would be necessary in deciding upon such matters as age of transfer from what would be primarily a " physical and social education " stage to that of a more formal " school education." It is in order both that individuals should receive due consideration and that the adequacy of schemes in their general application should be reviewed from time to time for the purpose of necessary modification that the consistent keeping of records is desirable.

Up to the present there has not been available a body of cumulative records concerning the educational progress of cerebral palsied children, especially those who could not readily be accepted in existing educational schemes.

The gathering of a relatively large body of data on their educability should serve, in some measure, to guide both teachers and others concerned with the care of these children so that at least they should be aware of certain psychological and educational difficulties which commonly are to be found as concomitants of the physical handicap.

(*e*) *Theoretical considerations.* Theories concerning the ætiology of the cerebral palsies admittedly are not primarily a matter for educationists, except in so far as the effects of various types of the handicap may present different problems in education. On the other hand, careful observation by teachers and others interested in these children's development may afford useful data to those whose main interest is in the cause of the handicap. Records of the development, or failure in developing, certain capacities may offer at least corroborative evidence to support differential diagnoses. Still more important, such observations may be of particular help in making prognoses with a view to future treatment.

Further, a growing body of data will suggest lines of inquiry which could profitably be pursued, not only by educationists but by others.

It is for this reason that reference is made, in an appendix, to some peculiarities observed in the birth histories of cerebral palsied children and some tentative suggestions made regarding the probable influence of certain birth conditions on the future mental development of some of these children.

(*f*) *Recommendations and conclusions.* Some of the conclusions drawn from the results of the inquiry may seem rather discouraging to many people who have spent much time and effort in arousing interest in the provision of special education for children with cerebral palsy. However, it is surely better to realize the limiting conditions within which a scheme, to be successful, will need to be planned, than to suffer repeated discouragement due to the inability of the more severely handicapped children to respond satisfactorily to more ambitious schemes.

It must be emphasized that such recommendations as have been made for the establishment of educational schemes for these children are intended for those who are unlikely ever to profit satisfactorily from existing schemes, or whose needs demand initially a different type of provision as a preparation for participation in less specialized schemes at a later stage.

In making recommendations a broad interpretation has been given to the term " education." Emphasis has been placed on the child's future living and the interests and occupation which may be opened up to him. The satisfactions obtained by these children through purposefully directed energy and through a higher degree of social competency which will increase their social acceptance are, for the great majority, likely to be of greater importance than the acquisition of a limited skill in formal school subjects. Reluctant though some teachers will be to accept such a suggestion, the fact remains that many of the more severely handicapped children are unlikely to reach a level of proficiency, for example in reading, which would provide them with a ready key to further interests. For many of these children the laborious and often quite fruitless effort expended might well be put to better use in training them in occupations which would continue to afford them satisfaction when they have left school.

(*g*) *Plan of work.* The various aspects of the problem which have been considered in this thesis are presented in five main sections, viz., introductory, psychological, educational, administrative and theoretical. This order is roughly that in which the inquiry proceeded.

A synopsis prefaces each chapter. This system was adopted in preference to that of a final summarizing chapter since, though detailed discussion of some aspects may be of relatively little general interest, an awareness of the main points is necessary for an appreciation of the reasons for the final recommendations.

The bibliography appended refers to most of the relevant literature on the subject which was available when the inquiry was undertaken.

CHAPTER II

THE MAIN TYPES OF CEREBRAL PALSY AND THEIR INCIDENCE

SUMMARY

(*a*) *Main types.* The present tendency is for spastic conditions to be classified on a numerical basis, according to the limbs involved, and to be differentiated from the other main types (athetosis and ataxia) each of which presents characteristic signs.

Sensory defects and intellectual impairment may be found as concomitants of all types of cerebral palsy.

(*b*) *Proportional incidence.* Variations in estimates of the proportional incidence of the different types have been influenced by source and size of sample. Estimates based on very large samples suggest that spasticity is found about eight times as commonly as athetosis and is about ten times as prevalent as ataxia and rigidity in children.

(*c*) *Sex incidence.* Large samples give evidence of a closely approximating incidence of cerebral palsy in both sexes, with only a very slightly higher frequency rate among boys.

(*a*) MAIN TYPES

(i) *Spastics.* There has been a notable lack of unanimity in the medical profession not only regarding ætiology, but in the matter of the terminology used in classifying the several types and degrees of handicap to be found among the groups now generically labelled " cerebral palsies." There is, however, a general tendency towards classification of spasticity on a numerical basis according to the number of limbs in which the typical clasp-knife rigidity of muscles results in stiffness of movement and often, with increasing age, in contractures which produce deformity. With this inability to relax muscles may also be found various degrees of intellectual impairment and also sensory defects particularly of sight and hearing. There may also be present abnormal flaccidity of some muscles, though this appears to be much less common. The term " monoplegia " is applied to a condition in which either one arm or one leg only is affected ; " hemiplegia " (right or left) describes a unilateral handicap, in which very frequently the arm is more affected than the leg ; " paraplegia " is applied to a state in which only the legs are affected and " quadriplegia " or " tetraplegia " to a condition with involvement of all four limbs. The terms " diplegia " and " double hemiplegia " are also sometimes found when all limbs show abnormality of movement, the former term being used more frequently to describe a quadriplegia in which the legs are more severely affected than the arms and the latter when the arms are more obviously affected than the legs ; the term " diplegia," however, is sometimes used to describe involvement of either both arms or both legs. " Triplegia " is used when three limbs (more often both legs and one arm) are handicapped ; further investigation of such cases, however, often shows them to have been quadriplegias in which partial spontaneous recovery has taken place allowing fair control of one limb. The term " Little's disease " is often found loosely applied to any of the above, though it is also found restricted to a type of paraplegia in which there is little or no evidence of concomitant mental impairment, and in such case is often of spinal rather than cerebral origin.

(ii) *Athetosis.* The characteristic picture of athetosis shows uncontrolled, writhing movements particularly of the limbs, but also frequently present in the face and tongue, so that grimacing, dribbling and articulatory speech defects are common in this group as are also some sensory defects.

(iii) *Ataxia.* This is one of the less common forms of cerebral palsy found among children, most investigators agreeing that it does not occur in more than five per cent. of cases at most. The general body balance of children with this type of disorder is usually poor, though in some cases the handicap is apparent only as a gross type of intention tremor, poor hand and eye co-ordination, or a staggering walk.

(iv) *Rigidity.* Those exhibiting this feature tend to be an even smaller group whose constant state of muscle tension has in the past led to their being classified often as spastics ; there are, however, certain clinical and pathological factors which would suggest a closer affinity with ataxic conditions in so far as the causal lesion is believed to be not (as with the spastics) in the pyramidal tract, but somewhere in the cerebellar system.

The education of children in any of the groups described above depends not only on the degree in which they approximate to what is accepted as within " normal " mental range, but also on the extent to which their physical condition allows them to put to full use their potential mental capacity.

The mental abilities and incapacities of cerebral palsied children have so far been assumed not to vary in direct accordance with the degree of handicap. However, in spite of evidence of reasonably good comprehension, the presence of a serious degree of motor inco-ordination (e.g. among children with severe athetosis) may prevent effectual use of potential ability. Where such is the case, and a child is prevented from profiting in any very useful degree from formal education, it is particularly important that the term " education " should be understood in its broadest connotation. It should be interpreted, that is to say, as a system of training, guidance and the offering of opportunities which will enable a child to develop his potential abilities to the fullest extent commensurate with his age, ability and aptitudes. By so doing, some assurance should be possible that, by the time he has reached adulthood, he will feel that he has some purpose in living, can contribute something, however small, to the general community (even though that for him may be represented largely by his immediate and possibly limited environment) and can appreciate the need for taking as responsible an attitude as his degree of social maturity warrants.

(*b*) PROPORTIONAL INCIDENCE OF MAIN TYPES

The need to know something of the distribution of the main types of cerebral palsy among children is for two reasons of possibly greater importance to those concerned with the provision of special educational facilities than it is for those whose main concern is the physical treatment of the child.

In the first place, medical treatment is an entirely individual matter whereas, with relatively few exceptions, the provision of special educational schemes must depend largely on proof that there are a sufficient number of children needing and able to profit from special facilities if these are made available. Secondly, differential classification of the main handicap groups is of practical importance to the educationist, because where children, in spite of for example a relatively severe degree of hemiplegia, are still capable of sufficient mobility to enable them to move around fairly independently, or with only a little help, and can use public transport or school buses, the problem of making educational provision available to those who are mentally capable of profiting from it is considerably eased. Where, however, the handicap involves all limbs and the child is entirely, or almost entirely, dependent on others, not only in moving about but for attendance to all his personal needs, the extent to which he can avail himself of existing educational provision is minimized. Attendance at day schools for the physically handicapped is impossible; boarding schools which can take such children are few and in any case, in the latter, the proportion of necessary staff to children is greatly increased, even if only a few such heavily handicapped children are accepted, and there is inevitably a resulting heavy increase in running costs.

Where children, when seated, are able to cope satisfactorily with situations demanding normal use of hands, the problem, from the point of view of the teacher, becomes mainly one of transport rather than necessarily one of " special " education, unless there are other reasons why a child is unable to follow a normal curriculum.

It is interesting therefore to compare such distributions of extent of handicap as are available from other sources with those found in this country. For this purpose, the differentiation between athetoid and spastic conditions has been ignored and the distribution made only in terms of the number of limbs involved. Monoplegias (one leg or one arm only) have also been classed with hemiplegias (a unilateral condition), triplegias (three limbs involved) with quadriplegias (four limbs) and diplegias with either quadriplegias or with paraplegias according to the apparent extent of the handicap and the application of the term.

TABLE I

Comparison of Distributions of Incidence Found in Main Types of Cerebral Palsy Handicap : Various Sources

Source of Information	Percentage Incidence				
	Quadriplegia	Hemiplegia	Paraplegia	Other	Total
1. California (Brockway[6] 1936) 1,000 cases..	32	41	26	1	100
2. New Jersey (McIntire[14] 1938) 146 cases	67	17	14	2	100
3. England and Wales (B.C.W.S. and N.F.E.R.) (1948–1949) 3,701 cases	26	46	28		100

Comparison of the above figures shows a much closer relationship between the proportional distributions found among the 1,000 California cases and among the 3,701 cases from various sources in England and Wales than between either of these large samples and the relatively small one referred to in the New Jersey survey. The difference in distribution may be due largely to the size of the samples. Scrutiny, however, of the distributions among groups from different places contributing to the total 3,701 cases of English and Welsh origin, suggests that the actual source of reference has an effect on variations found in the proportional incidence of the different degrees and extent of disability

The New Jersey figures were based on children known to a Crippled Children's Commission and are therefore more likely to involve a degree of selection, in so far as children would be more likely to come into contact with the Commission if, for one reason or another connected with their handicap, they were requiring special help. This impression is strengthened when, from the cases from English and Welsh sources, we extract a distribution of extent of handicap for the 474 cases applying for admission to a special boarding school exclusively for cerebral palsied children. The proportional distribution of types from this source alone is as follows :—

TABLE II

Distribution of Types Among 474 Candidates for a Special School for Cerebral Palsied Children : England and Wales

Source	Percentage Incidence			
	Quadriplegia	Hemiplegia	Paraplegia	Total
Special School Candidates (474 cases)..	59	14	27	100

One reason for the relatively heavier proportion of quadriplegias and lower incidence of hemiplegias in this distribution is fairly obvious. From the total population of handicapped children a considerable proportion of those with reasonable mobility and normal use of one hand at least are able, if reasonably competent intellectually, to attend either ordinary schools or day-schools for physically handicapped children. It is on behalf of those who are unable to fit into these types of schools that the greater proportion of applications are made to schools established especially for cerebral palsied children.

Since different forms of the handicap arise from abnormal conditions in different parts of the brain, in addition to the varying types and degrees of motor disability which result, there are found a variety of types and degrees of concomitant sensory and mental defects. Some of these defects, occurring more commonly among certain cerebral palsy categories, make the problem of " type incidence " one of practical importance in planning special education for these children. It is unfortunate that lack of uniformity in medical terminology has rendered even more difficult this matter of differential classification and has to some extent led to conflicting opinions as to the proportion of children in the different categories likely to be suffering concomitant mental impairment.

Authorities have stated variously and at different times that the different types of cerebral palsy motor disturbances are found in the proportions shown in Table III from which it will be seen that there have been fairly wide differences in estimates.

Contrary to the apparently increasing tendency in America, demonstrated in the above table, to consider the athetoid category as that with the largest incidence, an inquiry among 300 cerebral palsied

TABLE III

Distribution of Cerebral Palsy Types. Percentage Incidence: American Sources only

<table>
<tr><th rowspan="2">Authority</th><th colspan="6">Percentage Incidence</th></tr>
<tr><th>Date</th><th>Athetoid</th><th>Spastic</th><th>Athetoid and Spastic Mixed</th><th>Ataxic, Rigid, etc.</th><th>Total</th></tr>
<tr><td>Brockway[6] . .</td><td>1936</td><td>8</td><td colspan="3">—92—</td><td>100</td></tr>
<tr><td>McIntire[44] . . . .</td><td>1938</td><td>36</td><td>36</td><td>5</td><td>23</td><td>100</td></tr>
<tr><td>Phelps (a)[57] . .</td><td>1940</td><td>40</td><td>40</td><td>3</td><td>17</td><td>100</td></tr>
<tr><td>" (b)[59] . .</td><td>1942</td><td>40</td><td>40</td><td></td><td>20</td><td>100</td></tr>
<tr><td>" (c)[60] . .</td><td>1942</td><td>45</td><td>40</td><td></td><td>15</td><td>100</td></tr>
<tr><td>" (d)[62] . .</td><td>1945–46</td><td>45</td><td>40</td><td></td><td>15</td><td>100</td></tr>
</table>

children in New Jersey by Odoroff[52] (1945) gave about twice as great an incidence of spastic as of athetoid types. The data for this inquiry were obtained by selecting every other case from the alphabetical files of the Crippled Children's Commission, Trenton, New Jersey, so that the sampling was not prejudiced by a selection procedure which would be likely to influence the proportions of the different classifications.

In this country, an examination of the distribution of the various types of cerebral palsy found (*a*) among children presented at selection examinations at a special school and (*b*) among children from areas selected for special inquiry and other sources available during the

TABLE IV

Proportional Distribution of Types of Cerebral Palsy Among 780 Cases: England and Wales

Classification	Percentage Incidence	
	Special School Diagnostic Examination	Selected Areas and Miscellaneous
Spastic Quadriplegia	37	19.6
" Paraplegia	26	25.5
" Hemiplegia	13	35.3
Athetosis	13	7.8
Mixed Athetosis and Spasticity	5	2.3
Ataxias, Tremors and Rigidities . .	6	9.5
Total	100	100

research, shows that a proportional incidence of each of the main types was found as set out in Table IV.

Summing all types of spasticity for the purpose of comparing the above distributions with those published from American sources, gives the following category incidence.

TABLE V

Source (England and Wales)	Percentage Incidence			
	Athetoid	Spastic and mixed	Ataxic and other	Total
Diagnostic Selection	13.0	81.0	6.0	100
Special Inquiry Areas ..	7.8	82.7	9.5	100
Average	10.4	81.85	7.75	100

The remarkable discrepancy between the above findings, in which spastic conditions occur approximately eight times as frequently as athetoid conditions, and those reported from America is not merely interesting from a statistical point of view, but involves, from an educational aspect at any rate, a much greater issue, viz., the incidence of educability among these children and, as a corollary, the type and extent of provision eventually likely to be required.

(*c*) SEX INCIDENCE OF HANDICAP

From such statistics as are available it would seem that there is only a relatively slight difference in the incidence of the handicap to be found among boys and girls, although the extent of the difference varies a little according to the source of information. Estimates from other countries have tended to show rather wider differences in sex distribution than available material in this country would suggest is the case here.

The New Jersey (1940-41) Survey records proportions of 70 per cent. and 30 per cent. for boys and girls respectively, while J. Van Assen (Rotterdam, 1939)[1] gave 60 per cent. and 40 per cent. as the relative proportions found among children in Sweden and Holland.

From the returns obtained from the British Council for Welfare of Spastics, Educational Advisory Committee's Questionnaire (1948) and from the more detailed inquiries made in selected areas for the investigation conducted for the National Foundation for Educational Research, the difference in relative percentage incidence for the two sexes found in this country would appear to be much less marked, as the following tables show :—

TABLE VI

Sex Incidence of Cerebral Palsy Among Children : England and Wales

	Males %	Females %	Total
(*a*) *B.C.W.S. Returns*			
(i) County Areas (England) ..	57	43	100
,, ,, (Wales) ..	52	48	100
Boroughs (England) ..	53	47	100
,, (Wales)	63	37	100
B.C.W.S. inquiry (All Areas) ..	54	46	100
(*b*) *N.F.E.R. Selected Areas*			
County Areas	44	56	100
Boroughs	52	48	100
N.F.E.R. (All Areas)	51	49	100

Evidence of an equally closely approximating incidence in the two sexes was found from scrutiny of 575 consecutive cases seen from a variety of sources, including 474 children for whom application had been made to enter a special boarding school for cerebral palsied children, and 101 children seen at other places such as hospitals, schools, institutions and their own homes. Distribution of these children according to sex was as follows :—

TABLE VII

Sex Distribution of 575 Cerebral Palsied Children. Consecutive cases seen from various sources : England and Wales

Sex	Incidence	Percentage Incidence
Males	294	51
Females..	281	49
Total	575	100

Distribution of the 474 consecutive children applying for special school admission shows again only a very slight male preponderance, of a degree midway between the differences shown in the other distributions :—

TABLE VIII

Sex Distribution of 474 Consecutive Applicants for a Special School

Sex	Incidence	Percentage Incidence
Males	253	53
Females..	221	47
Total..	474	100

The overall incidence, found from a combination of 1,044 cases from the selected areas, special school applications and miscellaneous cases for whom individual histories were available, affords an even closer percentage distribution between boys and girls.

TABLE IX

Sex Distribution of 1,044 Cases from Various Sources: England and Wales

Source	Males %	Females %	Total
Special School Application ..	53	47	100
Selected L.E.A.'s	51	49	100
Miscellaneous	59	41	100
All..	50.8	49.2	100

CHAPTER III

INTELLECTUAL DEVELOPMENT

SUMMARY

(*a*) *Motor development and intelligence.* Delay in the achievement of head and trunk balance in particular has a retarding effect on motor and social education. Evidence is offered that, in general, a positive relationship exists between an earlier attainment of sitting balance and a relatively better intelligence.

(*b*) *Distribution of intelligence.* Intellectual superiority is rare among cerebral palsied children and intellectual inferiority is found in a high proportion of cases. The evidence for this, based on over 900 individual assessments and supported by less detailed grading of over 2,000 other cases, corroborates findings by investigators in other countries.

(*c*) *Intelligence and extent of handicap.* The extent of the physical handicap, including the presence of sensory defects, stability and social adjustment as well as intelligence, all influence the rate of educational progress. Evidence from nearly 800 children handicapped to various extents by cerebral palsy indicates that the heaviest proportional incidence of mental subnormality is found among those with the most extensive physical disability. Among athetoid children, assumed not necessarily to have suffered cortical damage, the general tendency is for intelligence distribution to be weighted heavily in the inferior ranges.

(*d*) *Assessing the intelligence of cerebral palsied children.* Confusion exists concerning the assessment of intelligence of children with cerebral palsy. A disinclination to accept results of standard tests is often emotionally determined through ignorance of their purpose. Appreciation of their function as measures of ability is clouded by the fact that they also reveal disabilities. Adaptations in administration of a test and in medium of response are sometimes necessary with heavily handicapped children. Any necessary modification should not vitiate the purpose of a test. It is fallacious to assume that non-verbal tests give a better measure than do verbal tests of the general intellectual capacity of these children. Very few children are found to be too handicapped for any response at all to be elicited. A child from whom no response is obtained can only, for practical purposes, be ranked as ineducable.

(*a*) MOTOR DEVELOPMENT AND INTELLIGENCE

The early developmental history gives some indication of a child's capacity for progress in certain directions even in spite of his handicap and although his achievement in other ways may continue to be limited. Many children have a history of marked retardation in achieving head, sitting and standing balance. Many of these children, but not all, are late in talking and in acquiring acceptable standards of continence. When a child shows all round delay in reaching these stages, it is hardly surprising if his early education (using this term in its broadest sense) also suffers delay. Whether, in later years, general intellectual backwardness is equally apparent among cerebral palsied children, whose delayed progress in early years has often been attributed solely to the effects of their motor incapacities, is a matter requiring investigation.

One of the most important " milestones " in a child's early development is undoubtedly the achievement of sitting balance. Until he can balance his head and trunk sufficiently to maintain a sitting posture for more than just a few seconds, the normal widening of his interests through visual stimuli is bound to be restricted. Ceilings are apt to offer little which will engage attention for long and in any case are too distant to be touched ; while cot walls, or such views of a room as are possible in a recumbent state, are apt soon to lose interest. Opportunities for the characteristic exploratory behaviour of the normal young child, who gradually learns through experience much about the size, distance, weight, colour, texture and fragibility of the objects within his reach, tend to be curtailed severely for a child who, at what should be predominantly the " exploring " stage of development, is still unable to sit independently.

Records of delay in achieving an independent sitting posture are found commonly enough in the case histories of children with cerebral palsy. As far as we can discover, however, there appears to have been no attempt at ascertaining whether, among these children, there is any general tendency towards a " peak " period of delay. No evidence has been offered as to whether the extent of delay, in spite of differences in degree of motor handicap, appears to show any particular correspondence with different levels of mental ability found later among these children, or with the age at which they begin to use speech. These matters were touched upon by Doll, Phelps and Melcher[16] but their study was restricted to only 12 cases, in all of whom mental deficiency was found in association with " birth injury." They were unable to establish among these few cases any relationship between the degrees of delay in early motor development and the level of mental capacity subsequently assessed.

It seems worth while therefore to take the 425 cases of cerebral palsied children over the age of 5 years for whom " sitting age " is known and whose general level of mental ability has been assessed, and to relate these two factors in the following table. In Table X is shown the extent of the general tendency among this group of children, of all types and degrees of intelligence, towards delay in achieving a stage of balance normally acquired by children between 6 and 9 months of age.

TABLE X

Percentage Distribution of "Sitting Age" Among 425 Cerebral Palsied Children

Sitting Age	Under 1 yr.	1–2 yrs.	2–3 yrs.	3–4 yrs.	4–5 yrs.	5 yrs. and over	Total
Percentage Incidence ..	10	30	18	16	8	18	100

Table XI distributes, according to IQ range, the percentage incidence of children who achieved sitting balance within each of the 1-year intervals.

TABLE XI

Percentage Incidence of IQ Levels Within each "Sitting Age" Group

IQ Range	Under 1 yr.	1–2 yrs.	2–3 yrs.	3–4 yrs.	4–5 yrs.	5 yrs. and over
Under 70	28	56	73	69	76	86
70–84	28	21	11	17	9	4
85–99	21	17	9	7	9	9
100–114	12	3	5	4	—	—
115–129	9	2	1	2	6	—
130 and over ..	2	1	1	1	—	1
Total Range ..	100	100	100	100	100	100

Table XII distributes the proportional incidence of the various "sitting ages" within each of the IQ ranges.

TABLE XII

Sitting Achievement, Age and Intelligence 425 Cerebral Palsied Children

IQ Ranges	Sitting Age in Years (Percentage Incidence)						
	Under 1 yr.	1–2 yrs.	2–3 yrs.	3–4 yrs.	4–5 yrs.	5 yrs. and over	Total
Under 70 ..	4	26	20	17	9	24	100
70–84	19	41	12	19	5	4	100
85–99	17	42	13	9	6	13	100
100–114	31	25	25	19	—	—	100
115–129	40	20	10	10	20	—	100
130 and over ..	20	20	20	20	—	20	100

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An examination of Table X shows that only one child in every ten had achieved sitting balance by the age of 1 year, although the average normal child achieves this stage by the age of 7–8 months, and that a proportion of only four in ten had accomplished the feat by 2 years of age, by which time normal children are already walking. Among these 425 children, however, 42 per cent. were still not sitting by their third birthday. The relative rise in percentage incidence of those still not sitting by the age of 5 or more years is due to the fact that there were some children in this sample with such a gross degree of physical handicap that they were not likely ever to be sitting unaided; among the majority of these, the incidence of serious mental retardation was also high.

In Table XI, a progressively diminishing incidence of children in the upper IQ levels and a corresponding increase in those of poorer mentality in the more delayed "sitting age groups" supplies evidence of a positive relationship between degree of delay in sitting balance and subsequently found general mental capacity. In the study of 12 cases referred to above, it was impossible to establish this relationship owing to the nature of the group and the small numbers involved. Table XII also brings out this relationship. From this table it may be seen that, among the 425 children, only 50 per cent. of those with IQ less than 70 were able to sit by the age of 3 years, and that by the age of 5 years, nearly a quarter of the total number of children with such inferior intelligence were still unable to sit independently. Between the children in the next two higher ranges (IQ 70–84 and 85–99) the spread of achievement age differs very little on the whole. Although in these two IQ range groups six children out of ten could sit by the age of 2 years, it should be noted that the proportion achieving balance by the end of the first year was as low as one in five.

Among children whose mental capacity was on the higher side of average (IQ 100–114) the number who could sit by 1 year of age is markedly larger, although still barely one in every three; eight out of every ten, however, could sit by the age of 3 years. Among children in this IQ range, a rather larger proportion took from 2–3 years to sit, but against this is offset the fact that no children in this mental ability range took longer than four years.

In the next and relatively superior group (IQ 115–129), in spite of the severity of handicap among many of these children, and although not more than 60 per cent. were sitting by the age of 2 years, there is a significantly larger proportion than in the lower IQ groups who were able to sit by the age of 1 year. The incidence of children in the highest mental category (IQ 130 and above) was very small and all without exception had a severe motor disability; the apparently very even spread of sitting age within this group is therefore of relatively little significance. Such evidence as we have about these children is not, however, entirely without interest, in so far as it indicates that, even when the ability literally " to sit up and take notice " is considerably delayed, a child with a superior mental potentiality does not necessarily suffer a directly proportional arrest of intellectual development because of his restricted functional expression. In spite of the general positive relationship between delay in sitting and intellectual retardation, there are sufficient instances of cerebral palsied children who are much delayed in reaching this developmental milestone and yet who are not mentally inferior to suggest caution in making too hasty presumptions about subsequent demonstrable intellectual capacity. Approximately 40 per cent. of those who later demonstrated reasonably average or better capacity were two years or more retarded in reaching sitting balance ; in fact nearly half of this number had still failed to achieve it by 3 years of age. Intellectual potentiality, however, in itself alone does not necessarily indicate learning capacity, and other factors must almost equally be taken into account. It is an unfortunate fact that where, in spite of a good potential mental capacity, there continues to exist a very severe motor defect and possibly other associated difficulties, actual learning capacity is often seriously reduced below expectation.

This point will be taken up again later with respect to general stability and capacity to mobilize and maintain attention and also in a later chapter in which speech difficulties and development delays in language will be discussed.

b) DISTRIBUTION OF INTELLIGENCE AMONG CEREBRAL PALSIED CHILDREN

So far as intellectual capacity is concerned, despite some variation between different estimates of the proportion of cerebral palsied children who can be ranked as " educable," in part due to differences in the connotation of the term, most authorities have agreed that the percentage of seriously subnormal children is disproportionately high,

TABLE XIII

Distribution of Intelligence Among 146 *Cerebral Palsied Cases. New Jersey Survey* (*McIntire* 1938)

Classification	Percentage Incidence
Gifted	—
Superior	7
Good average	12
Average	29
Low Average	13
Dull	13
Borderline F.M.	8
Feeble minded	18
All	100

and that of intellectually superior children correspondingly low, compared with normal samples from an unhandicapped population.

Referring to cerebral palsied children in Holland, J. Van Assen[1] estimated approximately 35 per cent. to be " intellectually inferior." He also stated that he had found a higher than average intellectual capacity among these children to be " very exceptional." He added further that, as might on neurological grounds alone be expected, the greatest percentage of mentally defective children were to be found among the quadriplegic and hemiplegic groups.

In America McIntire[44], referring to a survey (1938) of 146 subjects, found the distribution of intelligence as shown in Table XIII.

McIntire's subjects were seen at 12 different clinics and he notes that the percentage of those who were feeble minded varied, between the different clinic groups, from 15 per cent. to 38 per cent. of each group. He notes also that, among the feeble-minded groups, the percentage of those classified as idiots and imbeciles was greater than the percentage of these grades to be found in unselected samples of feeble-minded subjects and suggests that this is an indication that the feeble-mindedness found in a proportion of cases with cerebral palsy is of a secondary rather than a primary amentia type. McIntire's distribution shows an incidence of feeble-mindedness rather lower than that found in estimates from other sources, but it must be borne in mind that 36 per cent. of his subjects were classified as " athetoid " and therefore presumably, in the absence of other evidence, can be considered as cortically intact. In the 110 (out of 146) cases in which a rough estimate of the degree of dyskinesia present is reported, only 31 per cent. were classified as " severe," with 46 per cent. " moderate " and 23 per cent. " mild." Nevertheless the distribution reported by him shows in general not only a much heavier incidence of sub-normal levels of intelligence among cerebral palsied children than among samples of normal children, but also an absence of those of more than relative superiority. Reports on a group of 113 cerebral palsied children in Californian schools (Table XIV), show similar tendencies, though with an even larger proportion in the lowest ranges covering the subnormal and very dull children.

Phelps (Baltimore) has tended progressively to increase his estimates of the probable incidence of mental defect among children with cerebral palsy. In 1942 he stated[59] that not more than one out of four among these children had concomitant mental defects, but by 1946[62] his estimate had increased to one out of three. Odoroff[52] (New Jersey) found that out of 300 cerebral palsied children known to a Crippled Children's Commission, 103 were mental defectives, an incidence which most nearly approximates that of Phelps in 1946.

Reports from the New York Neurological Institute give further support to the evidence from other sources that mental subnormality is more commonly found among children handicapped by cerebral

TABLE XIV

Distribution According to Intelligence.
113 *Cerebral Palsied Children : California* 1944

IQ Range	Percentage Incidence
130 and over..	0.8
110–129	7.8
90–110	25.4
70–90	31.0
50–70	26.3
Under 50	8.7
Total	100.0

palsy than among the general population or those with other handicaps, V. O'Brien[50] stating that from 20 per cent. to 25 per cent. suffer from serious mental retardation. At this Institute at which, in addition to the main purpose of physical treatment, there is a day school class maintained for the 20 most intelligent of the more severely handicapped children, who attend daily until considered capable of entering one of the City's special schools, the distribution of intellectual capacity of the 43 children who had attended up to 1946, was as follows :—

TABLE XV

Intelligence Distribution of 43 *Cerebral Palsied Children Attending N.I. School Class. New York*

IQ Range	Actual Incidence	Percentage Incidence
110 and over	7	16
90–109	16	37
70-89	17	39
Impossible to estimate	3	8
Total	43	100

These children are drawn from the intellectual " cream " of cerebral palsied children, but even so the incidence of mental dullness is remarkably high.

Evidence from various sources of information in this country goes still further to emphasize the fact that concomitant mental retardation is a major factor to be considered among the many problems which these children present.

In a paper read before the Royal Society of Medicine in 1946, E. Stanley Evans[17] stated that, of 50 cerebral palsied children seen at a special unit of a large children's hospital, over 60 per cent. of those diagnosed as "spastic" and 10 per cent. of those classified as "athetoid" had proved to be ineducable.

Information obtained from an inquiry made in 1948 by the British Council for the Welfare of Spastics Educational Advisory Committee, though including reference to a large number of children so little handicapped that they were able to attend ordinary schools and, for lack of facilities for very detailed assessment, graded only into very broad and approximate categories, gave the following distribution :—

TABLE XVI

Classification According to Intelligence : 2,324 *cases B.C.W.S. Inquiry*

Classification	Percentage Incidence
Normal	44
Backward	27
Seriously Subnormal	14
Ineducable	15
Total	100

The above categories, however, being in themselves rather vague, were found to be open to wide interpretation by different authorities, particularly those in which few facilities existed for detailed examination by persons experienced in assessing the mental capacities of handicapped children. The fact that some of those children who were relatively slightly handicapped physically were in attendance at ordinary schools was frequently accepted as proof that their intellectual abilities were "average." In fact, however, it has been found that, though a small proportion of these children have average ability, there are many more who, though broadly within "normal" range, are dull. In many children the fundamental cause of their handicap is not manifest primarily in physical symptoms but, with a relatively minor degree of motor disability, is apparent rather in varying degrees of mental impairment either of capacity or stability. Where this is so, the inevitably slow educational progress of these children appears, more often than not, to have been attributed in the past to the effects of their physical disability rather than to their innate mental dullness.

Examination of the data on children seen in areas selected for special inquiry for the National Foundation for Educational Research investigation, from the detailed examination of children "screened" for admission to a special school for cerebral palsied children and from other sources, gives the following scatter of ability among 916 children.

TABLE XVII

Intelligence Distribution of 916 Children : Selected Areas and Special School Candidates

IQ's	Under 55	55–69	70–84	85–99	100–114	115–129	130 and over	Total
(*a*) Selected areas	113	118	78	89	40	9	1	448
(*b*) Special school candidates ..	207	98	80	53	17	9	4	468
Total ..	320	216	158	142	57	18	5	916
Percentage incidence	35	23.6	17.2	15.5	6.2	2.0	0.5	100

From the above table it will be evident that rather more than half of these children are mentally subnormal, with nearly four out of every ten coming within the "ineducable range" and a further two being at best of a mental level suited only to a type of education provided for educationally subnormal pupils, apart from any consideration of additional retarding factors due to physical disabilities. A further two out of every ten are mentally so dull that they are comparable in ability only to children in the lowest streams of the ordinary school system; while of the remainder, who may be considered to fall within the broad range of "normal" ability, three quarters cannot be classified as better than "low average" and "duller than average."

These findings are in line with those of several American psychologists. Fernald and Arlitt[18] found a mean IQ of 69, as did also M. V. Lee[37]; Doll, Phelps and Melcher[16] a mean IQ of 66, Wallin[74] a mean IQ 65 and Smith[67] a distribution in which only 22 per cent. were assessed as "normal," 16 per cent. "moron" and 62 per cent. as "imbecile and idiot."

It is of interest to separate the distributions of ability obtained (*a*) from the "selected areas" and (*b*) from the candidates for a special school for cerebral palsied children, since the figures for the latter population should give some indication of the kind of child for whom local education authorities consider the education available at such special schools to be appropriate and, in some cases, will indicate the type of child for whom no provision exists in its own area. A distribution, in terms of IQ ranges, of 468 applicants for admission to a special school for children with cerebral palsy is as follows :—

TABLE XVIII

Distribution According to IQ Range of 468 Candidates for Special Cerebral Palsy Schools

IQ Ranges	Under 55	55–69	70–84	85–99	100–114	115–129	130 and over	Total
Actual incidence ..	207	98	80	53	17	9	4	468
Percentage incidence	44.2	21.0	17.1	11.4	3.6	1.9	0.8	100

From the above it is clear that, while the range of applications has an overall spread of ability levels comparable with that of the combined groups in Table XVII, there is a tendency for the distribution to be spread towards the lower ranges to an even more marked degree than was found in the ability scatters from all sources combined. This would appear to indicate that, apart from a proportion of children for whom in their own areas no special educational provision is available, there is a tendency to put forward for admission to special schools for cerebral palsied children a considerable proportion of those who are incapable of profiting satisfactorily from the special educational provision already made in their own localities.

(*c*) INTELLIGENCE AND EXTENT OF HANDICAP

The matter of educability is not a question of IQ alone, but is influenced by such factors as extent and degree of the physical handicap symptoms, including the presence or absence of concomitant sensory defects and speech difficulties, as well as differences in temperament, personal stability and social adjustment. Some of these factors can be fairly readily assessed, but others do not lend themselves as readily to quantitative methods. The question of severity of physical handicap is one which cannot with any great accuracy be answered from much of the data available, but extent of handicap (i.e., number of limbs and other parts of the body affected) can be fairly accurately distributed from the records available. It has been stressed by various authorities, (*a*) that the degree of severity of the physical aspects of cerebral palsy is not necessarily any indication of the degree, if any, of mental impairment, and (*b*) that there is no reason why the children classified as " athetoid " should have a concomitant degree of mental dullness by reason of the physical cause of their handicap. With regard to (*a*), it is often difficult to compare data from various sources because of varying interpretation

TABLE XIX (*a*)

Handicap Extent	I.Q. Ranges							All
	Under 55	55–69	70–84	85–99	100–114	115–129	130 and over	
(i) *Special School Applicants*								
Quadriplegias	142	50	45	26	7	6	3	279
Hemiplegias	18	19	16	7	3	1	—	64
Paraplegias	47	29	19	20	7	2	1	125
All Special School Applicants ..	207	98	80	53	17	9	4	468
(ii) " *Selected Areas*"								
Quadriplegias	52	16	19	11	3	1	0	102
Hemiplegias	19	21	42	39	17	2	0	140
Paraplegias	11	13	16	15	7	1	1	64
All " Selected Area" Cases	82	50	77	65	27	4	1	306

of the terms " slight," " moderate " and " severe " and, additionally, because a child's mental status can have a considerable effect on the extent to which he makes use of his limbs and senses, whether handicapped or not. However, V. O'Brien (New York)[50] has stated that " Our case material shows . . . that there is no correlation between the severity of the physical handicap and the likelihood of intellectual defect," while Phelps[58] has stated that " The presence of athetosis in the face, with grimaces and drooling, is misleading, and spastic facial muscles give an unresponsive expression. It must be borne in mind that these may be, in reality, masks and bear no relation to the underlying mentality." In another paper Phelps[60] again states that " appearance in these patients is often very deceptive." He goes on to say, however, that " most of the mental deficiency is in the spastic group, since they represent largely cortical damage. It is difficult to explain true mental deficiency in the athetoids as their damage is basilar and it seems hardly probable that if damage were so extensive as to involve both the base of the brain and the intelligence areas in the cortex that the child would survive." The last part of his statement appears to assume that the basilar damage is necessarily severe and does not appear to allow for a combination of moderate or even slight athetosis together with a degree of cortical impairment. Evans[17] corroborated Phelps' assertion that mental impairment is found more frequently among the spastic groups and referred to an incidence of ineducable grades of rather less than 10 per cent. among athetoids compared with over 60 per cent.

TABLE XIX (*b*)

Percentage Incidence: Distribution of 774 Cases According to Intelligence and Extent of Handicap

(i) Special School Applicants	IQ Ranges							
Handicap Extent	Under 55	55–69	70–84	85–99	100–114	115–129	130 and Over	Total
Quadriplegias per cent.	30.3	10.7	9.6	5.6	1.5	1.3	0.6	59.6
Hemiplegias per cent.	3.9	4.1	3.4	1.5	0.6	0.2	0	13.7
Paraplegias per cent.	10.0	6.2	4.1	4.3	1.5	0.4	0.2	26.7
All per cent. ..	44.2	21.0	17.1	11.4	3.6	1.9	0.8	100.0
(ii) *Selected Areas*								
Quadriplegias per cent.	17.0	5.2	6.2	3.6	1.0	0.3	0	33.3
Hemiplegias per cent.	6.2	6.9	13.7	12.7	5.6	0.7	0	45.8
Paraplegias per cent.	3.6	4.3	5.2	4.9	2.3	0.3	0.3	20.9
All per cent. ..	26.8	16.4	25.1	21.2	8.9	1.3	0.3	100.0

among spastics in a group of hospital patients. In Evans' use of the term " ineducable " it is not, however, clear whether he was referring to educability in the school sense, or educability in the sense of response to motor training. Correlations between *extent* (but not *degree*) of handicap and intelligence found respectively among children in the " selected areas " and among those presented for examination at the special school were as given in Table XIX (*a*), in which athetoid and ataxic types are classed with the quadriplegias to whom they most nearly approximate in extent of disturbance of function. Table XIX (*b*) gives the same information in percentage form.

From an inspection of these tables, it is evident that by far the heaviest percentage of children showing marked mental defect is found among the group with the greatest extent of physical disability, i.e., affecting all limbs at least.* In the case of children put forward for admission to a special school, the percentage of such cases, as might be expected, is much greater even than that found among the total number of children with cerebral palsy in the areas selected for special inquiry. Among special school applicants, quadriplegias with IQ range below

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*Since the above was written, similar observations have been made by J. E. Wallin[74] (*Children with Mental and Physical Handicaps.* 1949), and by P. Asher and F. E. Schonell[78] (*Archives of Disease in Childhood.* Vol. 25, No. 124. Dec. 1950).

55 account for almost a third of the total applications made, and for at least half of all the applications made for quadriplegic children. Among the special inquiry groups such seriously subnormal quadriplegias account for about one-sixth of the total incidence, but again for about one-half of the quadriplegics considered as a group by themselves. While only about one in twenty-five of all the special school applicants was a hemiplegic with IQ less than 55, among all applicants with a hemiplegic handicap, about one in three was of this " ineducable " level. The " selected areas," though with a total percentage incidence of hemiplegia cases between three and four times as great as among the special school applicants, had an incidence of these children, with IQ less than 55, accounting for approximately one in seventeen of the total incidence and about one in seven of the total percentage of hemiplegias. The percentage proportion of paraplegias with mental defect among the special school applicants was again nearly three times as large as was found among the paraplegia cases from the selected areas. Among the special school applicants, such children accounted for more than one in three of the total paraplegia group, those in the " selected areas " accounting for approximately one in six of the total. The considerably larger percentage incidence of paraplegia with mental defect found among the special school applicants compared with those found in the " selected areas " (10 per cent. compared with 3.6 per cent.) probably reflects a tendency, commonly found among medical practitioners, to attribute retardation to the physical handicap when this is found in conjunction with mental subnormality and to hope that, if increased mobility can be effected through physical treatment, there will result also an improvement in mental status. The larger percentage in the " special school " group undoubtedly also reflects the difficulty found in accommodating in schools for the physically handicapped, even for a trial period, children who are not independently ambulant.

When we inspect the proportions of children falling into the next IQ range (55–69), that is children with mental ability approximating to the range of capacity found in most schools for the educationally subnormal, the proportional incidence found among the two populations (the special school applicants and those from " selected areas ") again shows a significant difference. Among the special school applicants group approximately one-fifth of all applications fall within this range, the same proportion being found among the total quadriplegic group. Among the " selected areas " group, children in this IQ range account for about one-sixth of the total, with quadriplegias with IQ 55–69 accounting for approximately one-sixth of all those with a motor handicap extending to all four limbs. In both populations, the proportion of children with superior ability is negligible and relatively few are to be found even with good average intelligence. In making the above comparisons, " degree " of handicap has been ignored and extent or range of handicap only has been considered. From this aspect it would appear that the greater the range of physical symptoms of cerebral palsy the greater the likelihood of a degree of concomitant mental subnormality. In spite of the frequency with which, in the literature on cerebral palsy conditions, statements have been made to the effect that, among the athetoid group, a normal scatter of innate intellectual ability is to be found, or even, by those with even less regard for accuracy, such loose statements as that, " most athetoid children are very intelligent", little, if any, statistical evidence can be found for these assertions. These impressions, for they cannot be classed as anything more definite, have arisen both from the fact that an intact cortex can exist in spite of structural abnormalities in the basal parts of the brain, and because, among the small percentage of those children with intelligence above the average and the negligible number with superior potential capacity, are to be found a larger proportion of athetoids than spastics.

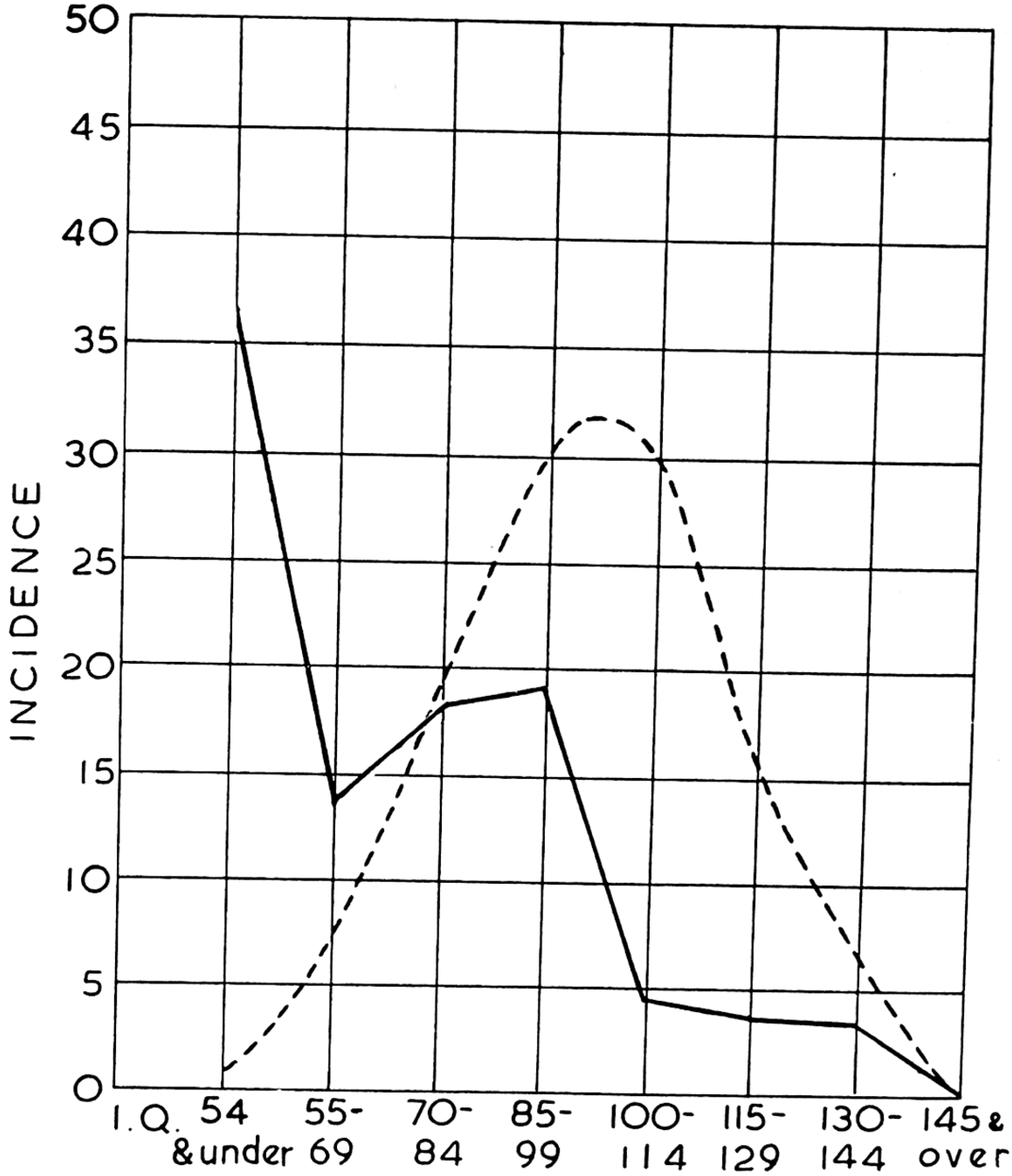
Distribution, according to IQ range, of over 100 cases of athetosis from various sources and including cases in which the degree and extent of the physical disability was only slight, shows the situation to be somewhat different from what has generally, and for lack of sufficient evidence, been assumed.

TABLE XX

Distribution According to Intelligence of 104 Athetoid Children

IQ	Under 55	55–69	70–84	85–99	100–114	115–129	130 and over	Total
Incidence	38	14	19	20	5	4	4	104
Percentage incidence	36.5	13.4	18.3	19.2	4.8	3.9	3.9	100

In comparison with the distributions of " all types " cerebral palsied populations, which include the spastic quadriplegias, hemiplegias and paraplegias, among athetoid children considered separately there is evidence of a slightly higher proportional incidence of those in IQ ranges above 100. The general distribution of intelligence among athetoids, however, is heavily weighted towards the lower end and there is a marked break, as among the other types, at the average ability level with a total of 87½ per cent. falling in ranges of " low average and below " as against only 12½ per cent. in the " good average and higher " ranges. Still more significant, in view of the fact that unfounded optimism has tended to inform so many of the prognoses concerning these children's capacity for education and training, 50 per cent. of the total were of subnormal ability with IQ less than 70.



Graph I.

Graph I shows this percentage distribution of the intelligence levels of 104 athetoids plotted for comparison against the distribution normally found among an unselected population.

(*d*) Assessing the Intelligence of Cerebral Palsied Children

A protestation made by parents of most cerebral palsied children in the course of any discussion of their problem is commonly to the effect that their children, however limited and inco-ordinated physically, are mentally bright. " . . . but he understands everything you say to him . . .", or " . . . but she knows what you are talking about . . .", are statements that time after time are produced hopefully, even after the giving of developmental histories that in themselves patently testify to serious mental impairment, or can only point to a likelihood of anything but an optimistic prognosis for the future.

It is, of course, understandable that different people are apt to stress different aspects of a child's behaviour and response as indicative of " intelligence", according to the different relationships in which they stand with the child and the varying demands which these relationships impose on him.

Nevertheless, some objective measure of the child's mental status and, if possible, his prospects for future development is also required.

Parents, teachers and others concerned with the child's education and training and with his physical welfare all, in varying degrees, need to be reasonably sure that he has sufficient intelligence to be likely to profit from opportunities given for treatment and training. Even on a physical level, much time may be wasted in prolonged repetitions of passively performed movements if a child has insufficient intelligence to make further use of the movement patterns that he has been taught. Without the ability to proceed from a relatively passive experience of " awareness of sensation " to the slightly more active one of " perception " and thence through the increasingly active stages of selective perception to cognition and connation, not only are time, energy and money wasted in abortive attempts at education, but actual harm may be done through making demands on a child which exceed his capacity for adaptation.

When a child is too young to go to school, or too handicapped, parents are without one valuable outside check on their own opinions which are naturally, and often to a large extent, emotionally determined. In any case, they do not readily accept from other people opinions which differ from their own, though to some extent the degree to which they are prepared to modify their own opinions will depend on the way in which any reasons for differing are explained to them. A measure of educability involves much more than an estimated capacity for perception, understanding and thinking, but certainly for a beginning, we need a reasonably accurate estimate of these potentialities.

Since " intelligence " cannot be estimated " in vacuo," and the relative adequacy of response to a situation is the only means of knowing whether the situation has been even perceived, it follows that ability to make use of some mode of expression, however crude, is essential in communicating the results of any choice or judgment made as a result of that perception and ensuing cognition.

If, of course, a child is so grossly handicapped that all his senses as well as his speech and motor control are impaired to a degree which makes perception and response, through any medium whatsoever, almost an impossibility, it can only be inferred that his " educability," however broadly that term be interpreted, will be practically zero. Where, in such cases or in others with widespread damage or maldevelopment of the brain, there is even a lack of " conditioning " to familiar daily routines, a serious degree of mental defect must surely be assumed despite the optimistic hopes often inadvisedly given to the parents of such children.

Where damage is not quite so gross or so extensive, and yet still so seriously interfering with a child's normal means of expression that he may be limited to the crudest of gestures or sounds to signify choice, approval or disapproval, it is still possible for a skilled and experienced worker to elicit sufficient response from the child to enable some estimate to be made of his capacity for perception, thought and judgment. Where a test situation involves a degree of manipulation of the material which is impossible to the child by reason of his motor disability, provided he has the requisite understanding of the task, which may have been presented to him either verbally, or visually, or through mime if he has an additional disability of deafness, it is usually possible to obtain an indication of the child's *intention*, even though he may not be able unaided to carry out the required manipulations.

It must be remembered that standard tests are not random activities, but that each is constructed for a definite purpose, success or failure being scored not necessarily against a " perfect " performance, but in relation to what has been found to represent the average response from a child of any one age or level of development.

Frequently, and not alone from uninformed persons but all too commonly from those whose professional training and experience should enable them to know better, may be heard comments about the "unfairness " of using, with handicapped children, tests constructed for use with those who are at any rate physically able and expressions of doubt as to the " reliability " of the results if such tests are applied to other children. It is significant, however, that such doubts are voiced by those who have no real understanding of the reason why tests are used or why certain tasks are of greater value than others in indicating the presence or absence of general or specific abilities. Obviously, when a child suffers visual, auditory, speech, or motor disabilities, it is necessary sometimes to modify either the form of a test or the mode of response or even occasionally to omit it altogether. Such modifications should, however, be noted in any interpretations of the results and on no account should tests which have had to be omitted be credited. That this is not unfair to the child should be obvious if the reason for applying tests is considered dispassionately. The psychologist's job consists in helping to arrive at a diagnosis of the child's difficulties and in making as accurate as possible an assessment of the abilities which he may be able to use in spite of his handicaps. It is often difficult for a parent to appreciate the fact that assessments of a child's abilities and disabilities are being made solely in order that guidance may be given in determining some very practical issues and that personal sympathies or other emotional factors cannot be allowed to bias judgment of the true picture.

The test is in many respects a standard measure against which may be evaluated the child's capacity for development and learning and in the light of which it is possible to a great extent to suggest in what directions modification may be needed in planning the child's education. To suggest that it is unfair to use standard measures for such a purpose is as absurd as to suggest that, in measuring a roll of cloth, if we suspect that the length is less than should normally be contained in the roll, we should use some other instrument than the standard yard measure. We measure the cloth in the first place to determine whether there is a quantity sufficient for our purpose and, at this stage of the proceedings, other questions such as that of quality need not arise. Undeniably, before we get down to the practical task of making something with our material, those other factors, e.g., of quality, must be considered. The cloth may be excellent as far as it goes, but may, in quantity, serve only a limited purpose ; or it may be adequate in length, but further inspection reveal that the quality is uneven in a patchy way or that certain threads are weak throughout the whole length. Again, the cloth, though originally of evenly good quality, may, since manufacture, have been damaged in certain places ; or, though of satisfactory length and apparent uniformity of texture, a particular piece may be unlikely to be able satisfactorily to stand up to the strain of general wear and tear to be expected in normal usage. It may be not pointless to press the analogy even a little further, and to remind ourselves that even though this cloth, for one or another reason, may be inadequate for the purpose for which we originally intended it, there is no need immediately to relegate it, without further thought, to a rag bag, for it is surely better if even a limited use can be found for it than none at all.

In other words, while in no way blinding ourselves to the limitations of the material (human or otherwise) with which we are working, we need also to bear in mind and actively to search for such positive assets as may be discoverable and to frame our work with these clearly in mind. As Bronson Crothers[14] has so clearly expressed it, " the term ' handicap ' at once suggests disease or disability and tends to establish medical control. On the other hand, education suggests the orderly development of assets, and teachers are necessarily looking at what is left rather than what is gone."

Such analogies as we have used above may well be applied to a child if the measure of his estimated intelligence, expressed quantitatively, is compared to the actual length of cloth ; the damaged patches, unevenness and weak threads compared to those inabilities due to his specific handicaps, and the general wearing quality taken to symbolise his ability to stand up to the demands of a normal environment, and to be independent socially and emotionally in a degree appropriate to his age and circumstances.

To return to the matter of tests, it is necessary perhaps to emphasize that what, for example to the uninitiated, may appear to be solely a measure of manipulative skill, may in fact employ a manipulative activity as a means of expression of memory or judgement. It is important to realize when this is the case, in order that any modification of the standard form of the test may not in fact eliminate the very factors which the test has been constructed to measure.

We may take as an example a form of test from the Terman Merrill scale which involves bead threading and occurs at three different levels. To a person unfamiliar with the underlying purpose of the tests, all three would appear to be tests of manipulative skill and, as such, probably impossible of achievement to a child with, for example, a severe quadriplegia, whether athetoid or spastic. However, even at the lowest age level at which this type of test occurs, its purpose is multiple. The child's response will indicate first whether he has understood an instruction to observe a demonstration of what he himself will be asked to attempt afterwards; secondly, whether he has grasped the principle of " threading", which will involve comprehension of the fact that a sufficient length of the tag must be pushed through the hole before it is possible to change from " pushing " to " pulling " ; thirdly, if he can begin on the task, his response will demonstrate his ability to remember instructions and maintain his initial purpose for a period appropriate to the age level at which the test is placed. Even at this early stage therefore, the problem is one of comprehension and direction of attention as much as of purely mechanical skill. Since this is so, modification at this stage may take the form of enlarging the material to a size with which even quite a severely inco-ordinated child might cope provided he understands the task. If such modification be made, however, it must be realized that the test, even if successfully achieved, will no longer provide evidence of ability for relatively fine co-ordination. At the higher levels at which occurs what might, at first sight, appear to be the same activity, the test involves again matching a demonstration of threading, but now also the making of patterns of different shaped beads. The test has now become a test of form perception and discrimination and of spatial relations and visual memory, rather than merely manipulation. As the completed patterns are shown to the subject only for a limited time before he is requested to construct similar patterns, at this stage the size of the material is an important factor in the preliminary viewing. The standard material is such that the completed pattern may be viewed as a whole within the immediate field of vision, without the necessity for head movements in order to include the extremities of the pattern. To attempt to modify the situation at this level by increasing inordinately the size of the material would, in effect, so alter the test that it would no longer be valid to indicate the main ability which it was devised to measure. At this stage, therefore, modification may be made only in the mode of response and here again care must be exercised. It might seem an obvious and simple solution to suggest that, if the child has speech (even monosyllabic speech) he might name in order the different shapes which must successively be threaded. Such a procedure would, however, ignore an important element in the standard form of the test, viz., the ability to retain in memory the pattern form while occupied by the activity of threading and to avoid confusion, or mere perseveration in " threading". With a fair verbal memory, but a relatively poor ability to visualize and remember spatial relationships, children may be able to name the successive order of shapes required, their response in such case depending on immediate verbal recall. Many such children will be found, however, during the intervals devoted to the necessary manipulative activity, to have lapsed in the verbal recall on which they were mainly depending and will produce an inaccurate pattern. Even on occasion when the verbal recall has been accurately maintained, children with poor shape discrimination have been found to reproduce inaccurate versions. Where, therefore, a child cannot himself manipulate the material, although the threading may be carried out to the child's instructions, the work must be done at a rate as nearly as possible consistent with that normally achieved by a child at the test age level. Further, in indicating the shape of bead which he intends should next be threaded, a better estimate of his ability to complete the task accurately will be obtained if, instead of naming the shape, the child is required to indicate his choice by gesture. For this purpose it is useful to have, stuck firmly on a card, one or more of each of the three available shapes from which his choice may be made. It is better to have at least two of each, set out in random order, since the conditions of making his choice will then approximate more closely to those governing his selection from the standard box. The use of such a " selection card " is, however, a matter of practical convenience and to be used only in such cases as those in which the child would be unable, without scattering the contents of the box each time, to point to the shape which he next required. Again, to bring the situation in line as far as possible with the standard form, when a child has insufficient control to insert the thread himself, but can manage to grip the end tag, after it has been inserted for him, he should be asked to complete as independently as possible the final pulling of the bead down the thread.

Thus, in a discussion of only one small item of a test scale, it should be clear that many factors are involved and that results based on substitutions and modifications of the standard form are liable to be most misleading unless they are made with full knowledge of the nature of the test, its aim as a whole and the relative importance, for diagnostic purposes, of the various aspects of the task. There are several others of the " standard " test situation which, from diagnostic and prognostic points of view, have considerable value if they can be applied. Though it is commonly asserted that the difficulty in assessing cerebral palsied children is caused through there being many of these tests that are physically impossible for them to achieve, a more factually correct statement would be that while the effects of their handicap on the intellectual functioning of many of these children is such that certain abilities are, in fact, impaired or seriously diminished, in the vast majority of cases, to a skilled and experienced psychologist, the difficulties imposed in getting a measure of the child's capacity are not insuperable. Infinite patience and the necessary precautions against fatigue must, however, be exercised and any ingenuity used in adaptation must not be employed without full reference to the ultimate aim of the standard test, particularly if the result is to be expressed quantitatively and with reference to a " normal " performance.

Another comment frequently heard is that " cerebral palsied children are different," and that therefore " other kinds of tests " should be used to assess their capabilities and possible educability. When pressed to define more specifically the ways in which these children differ from other handicapped children, the speakers almost invariably refer to the fact that the more seriously handicapped child so often has had less experience of life outside his home than has an unhandicapped child or a child with a single sensory defect. Again, it is often asserted that he has difficulty in carrying on a conversation or that he has had fewer chances of progressing through the various levels of sense development, through which the normal pre-school child passes, through the medium of play, without necessarily being given formal " training." Though these facts are undeniable, and emphasis on the value of sensory-motor training at the pre-school level has been laid by such writers as Stutsman[71], Kuhlman[35], Gesell[23] and others, there is no definite evidence that a motor disability, from an early age or during the developmental years, is *in itself* a cause of intellectual impairment, however much it may result in educational retardation. Reference to this point is made by Schroeder[63] in discussing behaviour difficulties in children showing results of birth trauma and again, among others, by Boorstein[4], O'Brien and Hewson[51], Hubbard[29] and Evans Lord[40] all of whom comment on the fact that improvement in physical capacity does not carry with it any alteration in measurable intellectual efficiency, even when " social response " may seem to have brightened.

As regards the limitation of range of experience through environmental restrictions, this fact again is obvious, inasmuch as a seriously handicapped child, who cannot move about freely, cannot so readily and at will investigate the various objects and events of interest normally encountered by an active child. On the other hand it is frequently forgotten that many handicapped children are very much the centre of interest and attention in their homes ; are talked to and encouraged to respond as freely as possible and have more opportunity than is sometimes imagined of observing, for example, daily routines and the type of behaviour considered socially acceptable in response to situations which call for judgement and choice. The child who is less economically privileged may often be found to have had even greater opportunities of taking part in, or observing, the normal round of daily life in his home than other children whose parents can afford to delegate their charge to nurses or attendants and who pass their days in possibly greater material comfort, but also very often in an environment which is not only physically but mentally more sterile. It is a common experience, for example, to find a cerebral palsied child who passes much of his day in a living room or kitchen, which is the hub of life in his family, where he can plainly see a clock and hear frequent references to the time made by his mother in the course of her attempts to prepare and serve meals in conformance with the needs of a family whose hours of school, work and social commitments differ widely, and yet who has never shown the slightest interest in learning to tell the time. Such apathy and lack of initiative in using opportunities are all too common among these children. With respect to the objections to the use of tests standardized on normal children and the suggestion that " different tests " should be used for cerebral palsied children, it is again necessary to remind those who express such opinion that tests are given for specific purposes and that, in the process of learning, the handicapped child, no less than the normal child, needs to be able to perceive, comprehend, discriminate, remember, recall, perceive relationships, reason analogously, and to be able to re-apply what he has learnt in one situation to a similar situation or, if necessary, make suitable modifications. If any of those abilities, among others, are absent, then his educability will be proportionately reduced.

For singularly few children, not more than one in many hundreds, has it been found impossible to obtain a reasonably accurate measure of these fundamental essentials for education and in the hands of a skilled examiner the number of children who require any very considerable modification or omission of tests has been found to be remarkably small.

Children with severe speech defects are, of course, at some disadvantage in responding to tests which call for verbal response. In the case of these children it is not sufficiently realized that, although they may have difficulty in carrying on a spontaneous conversation, they can more often than not make such monosyllabic replies as will satisfy the demands of many tests, or will be able to demonstrate by mime or gesture that they have understood the question and to give some indication of the responses which they deem suitable. In certain cases, though these do not occur often, where a monosyllabic reply, or mime, would be insufficient, it is possible to obtain at any rate an estimate of the range of a child's capacity for reasoned judgement by giving a choice of responses from which the subject may select that which appears to him to be the most appropriate and may signify his choice by nodding his head, or by some other gesture requiring a minimum of physical effort. Such test situations, however, do not occur at the lower mental age levels, and if, by the time they occur, a child is still so grossly handicapped that he can give no indication at all of what his choice would be, any hope of educability would be minimal.

Another common fallacy is to expect that a much more accurate estimate of the ability of a child with a speech difficulty can be obtained by the use of " non-verbal " tests, i.e., either those depending on " symbolic reasoning," or even " performance tests." Such suggestions ignore the fact that, although admittedly some well-standardized " symbolic reasoning " tests will give a very good measure of a child's ability for non-verbal reasoning, and in general provide much evidence that is essential in making a prognosis of educability, particularly with respect to ability for dealing with subjects involving number and spatial relationships, such tests in themselves cannot be expected to supply evidence about factors which they were not designed to measure. Though some well-standardized " perceptual reasoning " tests given in conjunction with certain " verbal " tests are found to provide a fair indication of general ability, if a child is able to cope with the verbal aspect of such a " verbal-non-verbal " battery, there seems no obvious reason why the Terman-Merrill scale should not be used, since so far this scale still provides the most fruitful battery of diagnostic tests for use with children.

The question of any significant differences in test results obtained from brain injured children was investigated by Hoakley and Frazeur[27]. They found that samples of both types of children, matched for chronological and mental age, revealed only one item in the Terman-Merrill scale (Form L) which showed any statistical difference—viz., diamond drawing. On following this investigation with another[28] into any possible differences shown in the Arthur Point Scale applied to physically normal and brain injured retarded children also matched for age, they found no significant differences.

Other suggestions sometimes put forward refer to the possibility of using purely manipulative or " performance " tests. Such suggestions ignore apparently not only the fact that physical inco-ordination is the most obvious symptom of cerebral palsy, but that time is, more often than not, a major factor in the scoring of such tests. Further, as is well known, few really well-standardized performance tests exist and even these are of very limited use, serving less as a measure of general ability than as useful adjuncts in the diagnosis of special abilities and disabilities.

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CHAPTER IV

VERBAL ABILITY AND SPEECH DEVELOPMENT

SUMMARY

(*a*) *Verbal Ability* was assessed by three types of test, viz., range of vocabulary, verbal memory and verbal reasoning. Results from 200 cerebral palsied children showed that on all three types of test these handicapped children were inferior. This finding has important bearings on the education and training of these children. The erratic control, seen in its physical aspect as a motor disability, appears especially among athetoid children to be manifested psychologically in ideational perseveration and conceptual confusion.

(*b*) *Delays and defects in speech development* are common among all types of children with cerebral palsy, especially those with ataxia and right hemiplegia. Progress from " single word " to " sentence " speech is often slow and tends to retard social development. A comparison of achievement ages of sitting and speaking among 150 children shows that although *rates* of achieving both are delayed, the *order* in which they develop tends to follow the normal pattern.

(*c*) *Articulatory defects* are found in approximately 70 per cent. of these children. They are due more to the effects of a central disturbance on the speech mechanisms than to actual malformation of speech organs. The incidence of speech defects found among a group of " normal " children at three age levels is compared with that found among handicapped children.

(*a*) VERBAL ABILITY

We can next consider whether, among these handicapped children, there are any indications of a common weakness in verbal ability. The term " verbal " is used here without reference to fluency of articulation. As far as possible articulatory defects were ignored in the scoring of tests of vocabulary, verbal recall and reasoning. Where the existence of a defect rendered communication difficult, but the gist of a required response was given in such a way as to leave little doubt that executive difficulties alone prevented fuller and clearer expression, the child's intention, if correct, was given full credit.

Three types of test were used in assessing verbal ability, viz., vocabulary by definition, verbal recall and verbal reasoning.

The ability levels of 200 cerebral palsied children on these three types of test are shown in Tables XXI, XXII and XXIII. In these same tables are shown also for comparison the percentage successes, on the same tests, of very large groups of physically normal children on whom the tests[45] were standardized.

TABLE XXI

Chron. Age Years	V		VI		VIII		X		XI		XII		XIV	
	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.
5	42	86	38	36	0	4	—	—	—	—	—	—	—	—
6	80	94	72	67	22	17	—	—	—	—	—	—	—	—
7	59	96	50	89	0	44	0	5	—	—	0	1	—	—
8	83	98	78	97	39	66	17	15	11	2	5	3	—	—
9	90	—	77	99	47	83	7	39	3	14	3	10	0	4
10	79	—	75	—	46	93	12	59	8	28	8	21	8	8
11	70	—	70	—	60	98	10	76	0	58	0	46	0	32
12	81	—	81	—	73	97	54	86	27	71	9	64	0	48
13	—	—	—	—	93	99	57	92	43	84	36	76	14	64
14	—	—	—	—	88	—	62	96	12	84	0	81	0	70

TABLE XXII

Chron. Age Years	V		VII		VIII		IX		X		XI		XII		XIII	
	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.
5	35	64	19	25	0	7	0	3	—	—	—	—	—	—	—	—
6	53	83	25	41	8	23	5	6	3	9	—	—	—	—	—	—
7	32	90	23	70	9	44	4	26	4	19	0	4	0	4	0	4
8	72	94	39	81	28	59	17	38	17	35	0	14	0	9	0	8
9	77	—	60	87	40	74	7	61	7	48	7	30	0	20	0	22
10	67	—	50	96	25	75	17	79	4	67	4	40	4	39	4	38
11	70	—	30	96	20	84	20	79	10	63	10	50	10	48	0	51
12	82	—	64	95	64	87	64	86	36	76	36	61	18	63	0	58
13	—	—	93	96	71	95	50	94	29	80	14	74	7	77	0	69
14	—	—	88	—	75	93	37	94	25	87	0	72	0	71	0	69

TABLE XXIII

Verbal Reasoning (N = Normal Group). Percentage Passing at Test Years

Chron. Age (yrs.)	VII		VIII		IX		X		XI		XII		XIII	
	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.	C.P.	N.
7	14	55	5	30	5	7	5	10	0	7	0	4	0	1
8	44	74	28	58	22	27	22	25	11	16	5	11	0	6
9	47	84	23	81	7	48	7	46	3	34	3	24	0	25
10	46	93	29	82	21	67	13	63	13	51	8	47	8	40
11	50	95	50	91	20	79	10	60	0	65	0	56	0	52
12	82	96	64	90	55	77	45	74	36	75	18	62	0	63
13	86	98	86	96	50	89	36	83	36	80	29	75	29	69
14	75	—	75	97	50	90	0	89	0	86	0	85	0	74

These distributions show that on the whole, at all age levels, the verbal abilities of children with cerebral palsy are far below those of unhandicapped children not only in range of vocabulary, but even more in verbal recall and to a still more marked degree in verbal reasoning. From the point of view both of specific school education and general response to training this relative weakness is a factor to be taken into account by those who have charge of the education and treatment of these children. Failure to give due attention to choice of suitable vocabulary, i.e., to speak in such a way that a child's comprehension is restricted by the use of too many unfamiliar words, is probably a much commoner fault among others than teachers who realize, or should realize, that full co-operation on the part of a child cannot be expected if he does not understand what is being required of him.

Again, realization that recall is generally poor among these children should result in a modification by teachers and others of the memory demands which are made in the course both of general and specific training and education.

That these weaknesses are not yet fully realized is apparent from the frequency with which comments are made regarding the " disobedience " and " forgetfulness " of many of these children. Obedience in any child can only be expected if instructions are understood and accurate remembering is possible only when what is to be recalled does not overtax the available capacity for memorizing.

The poor reasoning ability which so many of the cerebral palsied children show may be expected not only in view of their tendency to a poor level of intelligence for their age, but also because of their relative lack of the verbal tools of reasoning. Even at an age when the need for justification of an assertion is recognized (i.e., from about 7 years of age) the actual form of any supporting statement depends very much on the level of language development then attained and on the range of vocabulary available for expression. The ability for reasoned argument involves both a certain minimum level of language development and a degree of social maturity, below which any reasoning tends to be expressed rather in the form of a plain denial or assertion. A handicap which tends to encourage a child to remain overlong in the " simple statement " stage of communication is likely further to retard the development of conversational abilities and prevent normal progress in the use of more flexible and complex forms of sentence structure in speaking. Limitations of vocabulary and immaturity in mode of expression also tend to have an adverse effect on progress in reading. Among cerebral palsied children, on the whole, range of vocabulary tends to lag two or three years behind that of the average normal child, while ability to express reasoning verbally tends to be retarded by three or four years. This situation must inevitably have an effect not only on reading but on progress in other school subjects and in particular on those stages in arithmetic which involve the reasoned application of principles.

A characteristic observed commonly among these children is a tendency to ideational perseveration. This perseveration takes the form of a sporadic halting in the development of an idea, this interruption in conceptual fluency often manifesting itself in phrasal repetition.

Among athetoid children confusion both in developing an idea and in giving it expression appears to be particularly common. Among some fairly intelligent children, occasional unexpectedly bizarre responses and " flights of ideas " seem to result from a sudden inability to control the flow of conceptual association. Among those whose speech is voluble though not necessarily clearly articulated, the effect of thought perseveration and confusion is to make verbal expression appear even more unintelligible than it would otherwise be if hampered by an articulatory defect alone.

These tendencies to conceptual and verbal perseveration and confusion appear to form a psychological parallel to those physical conditions of the handicap in which purposeful movements are initiated but are subject to interruption by muscle overflow and sudden loss of directional control. Any objective measurement of these verbal peculiarities was not practicable, but they were observed so frequently among the children, and in particular were such a common characteristic of those with athetosis, that the author began to label the tendency " athetoid thinking " when noting it in the course of observation.

(*b*) DELAYS AND DEFECTS IN SPEECH DEVELOPMENT

Among all categories of cerebral palsied children high proportions are found both of those who have articulatory defects and those whose history shows a marked delay in language development. In particular is to be noted the frequently wide gap between the age at which monosyllabic speech is achieved and that at which the " sentence form," however simple, begins to be used.

With the majority of normal children up to the age of about seven or eight months, vocalising consists rather of motor reactions to external stimuli than of specific imitations of mature speech patterns. From about nine months to 14 or 15 months active imitation characterizes the child's response both in vocal and other fields ; L. Stein,[68] for example, has drawn attention to the fact that specific vocal imitation and attempts at scribbling begin to be noticed about the same age, i.e., from about 10–12 months onward. From 14–15 months, until approximately two years of age, the child is in process of discovering and using the fact that certain types of vocal " imitation " consistently effect certain responses from those in his immediate environment and he begins therefore to use such imitations in order to draw attention to his personal needs. His speech, though not necessarily consisting of words in their standard form, is becoming purposive, though for the time being remaining what Neumann has termed " emotional-volitional" in character. At this stage, adaptive speech is extremely important, inasmuch as it provides an important social link between the child and those in his immediate circle and, although characterized largely by the use of substantives, is the stage at which the foundations of syntactic speech are being laid, the nouns being used increasingly with a verbal intention.

The increasing use of speech in a simple syntactic form can be observed usually from the age of about two until three, at which time the question form of communication emerges and enables the child to widen his vocabulary and both directs his attention to, and encourages his appreciation of an ever-widening environment, which in turn further stimulates his interest.

It is common to find delay in reaching these stages among the very dull, but among handicapped children such delays are not only found among the intellectually inferior but, to almost as great an extent, among those of better potentiality if the physical symptoms of their handicap manifest themselves in the speech organs or in any way interfere with the production of speech.

For children who are liable to be restricted in the extent to which they can take an active and inquiring interest in their surroundings and whose handicaps, in any case, tend to render them socially dependent for a much longer period than the normal child, delays in developing powers of communication are likely to have further adverse effects on social development and adaptation. The normal " give and take " of conversation and exchange of ideas is limited and thereby over-dependence and, in some cases, an intellectual apathy is perpetuated.

Among cerebral palsied children whose histories show developmental delay, the greatest proportions are found among the ataxic cases (60 per cent.) and among those with right hemiplegia (56 per cent.). In all categories the incidence is high, however, and in a sample of 500 cases (all categories) we found speech retardation in 40 per cent. and 16 per cent. still with no speech. Of the latter, 11 per cent. were found among children between 4½ and 7 years of age, the other 5 per cent. being from among those aged from 7 to 14 years. In the New Jersey Survey, lack of articulated speech was found in 5 per cent. of cases, but we have no evidence as to the age group to which this referred.

The adverse effect of delay in sitting balance on the normal stimulation of a child's interest in his environment was touched upon briefly in an earlier chapter.* It seems pertinent at this point to offer some specific evidence on the relationship between delay in achieving sitting balance and retardation in speech and language among cerebral palsied children. Normal children usually say their first words by the end of the first year and, unless mental retardation is present, are rarely later than 18 months in reaching this stage. Children with a cerebral

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*Chapter III (*a*) " Motor Development and Intelligence."

palsy handicap, as we have already seen, are for the most part much later in speaking and also in sitting, but we have not yet offered any statistical evidence of actual correlation between the two skills.

In the following table therefore, we have extracted from the histories of 150 of these children the data necessary for such a direct comparison.

TABLE XXIV

Comparison of " Sitting Age " and " First Words Age " : 150 Cerebral Palsied Children

Sitting Age (yrs.)	First Words Speech Age							
	Under 1 yr.	1+ yrs.	2+ yrs.	3+ yrs.	4+ yrs.	5+ yrs.	Total	Approx. Percentage Incidence
Under 1 yr. ..	2	—	—	—	—	—	2	1
1+ yrs. ..	—	30	12	7	3	1	53	35
2+ yrs. ..	—	1	25	8	3	5	42	28
3+ yrs. ..	—	1	4	20	2	1	28	19
4+ yrs. ..	—	—	2	2	4	1	9	6
5+ yrs. ..	—	—	1	2	3	10	16	11
Total ..	2	32	44	39	15	18	150	
Approx. percentage incidence	1	21	30	26	10	12		100

It will be seen that, in comparison with the distribution shown in Table X (sitting age of 425 cerebral palsied children) there is, in the above Table XXIV, a slight difference in the proportional distribution of children achieving sitting under the age of 2+ years. This is due to the fact that the larger sample referred to in Table X included a greater proportion of children, with relatively slight motor handicaps, who later were able to attend ordinary schools or those for physically handicapped children. The group in Table XXIV, however, were, for the most part, children who had been unable, for one or another reason, to take advantage of such educational provision. Among such a group therefore, it is only to be expected that fewer would reach a stage of independent balance at the earlier age levels. These children are, however, those with whom at present we are most concerned.

Two interesting points emerge from the above table. First may be seen that, despite delay in both achievements, there is a close approximation between the ages at which sitting balance and " first words " speech are respectively attained. Of 53 children who first sat independently between 12 and 24 months of age, a majority (30 children) achieved " first words " during the same period ; of 42 whose sitting was delayed until some time between their second and third year, 25 also did not speak until they were between 2 and 3 years old, and among 28 who learned to sit between the third and fourth year, 20 began to speak sometime during the same period.

The second point of interest may be found in the fact that, in addition to this " modal " coincidence of speech with sitting age during each of the successive years, there is evidence that, on the whole, independent sitting balance tends to be achieved shortly before the articulation of single words.

Among normal children these two stages, sitting and speech, are attained approximately at ages 7–8 months and 9–12 months respectively. Among cerebral palsied children very few are able to sit or speak by the end of their first year. By their second birthday, however, among this group of 150 children, 22 per cent. were achieving " first words " and 36 per cent. were able to sit ; by their third birthday, 52 per cent. had begun to speak and 64 per cent. could sit ; and so on throughout the successive age levels. This evidence would suggest that, in general, among cerebral palsied children the *order* of development is not usually disturbed even though the *rate* is delayed.

From the point of view of prognosis, the evidence offered above, distressing though in some respects it may be, nevertheless affords some spark of hope to those who may begin to fear that because a cerebral palsied child has neither sat nor spoken by the time it is 3 years old, it will never do so. Among the 150 children whose " sitting " and " first words " ages were compared, it will be seen that 36 per cent. did not sit and 48 per cent. did not speak until after their third birthdays.

(*c*) ARTICULATORY DEFECTS

We have been discussing so far the question only of developmental delay in establishing communication by vocal expression, without reference to the quality of articulation. If we now consider the matter of speech defects, we find that these occur in a rather greater proportion of these handicapped children. Although some of the more intelligent among those with motor defects have no history of outstanding delay in their early efforts at talking, there is evidence that large numbers, even of these more intelligent children, were retarded in the progression from substantive to syntactical speech. Such retardation among these children is undoubtedly due, in part at least, to the often considerable difficulty which they experience in articulation. Such difficulty is apt to encourage economy in the effort which these children must necessarily expend in making themselves understood and, when the required reaction from those around them can be obtained by " single word speech", there is an understandable tendency to restrict speech accordingly. The fact that the speech regions are located predominantly in the left hemisphere of the cortex explains to a great extent why children with structural abnormalities or damage in that area, and with a consequent right hemiplegia, show a much higher proportional incidence of developmental speech delays and articulatory speech defects than do those with a left hemiplegia consequent upon abnormal conditions in the right hemisphere of the brain.

If the physiological pattern is disturbed in any way, disorders in the production of speech are likely to occur and to result in either dysarthria (difficulty in articulation) or, in the case of extremely severe disturbance, in anarthria (lack of speech). Where difficulties of production occur, the effects of a central disturbance may be seen in lack of the necessary control of the speech mechanism muscles, tongue, palate, lips and respiration. Among children with spasticity, " reversed breathing " is a common symptom, with diaphragm contraction on expiration. Among children with athetosis, irregularities of the breathing rhythm are more often found, with tension from other parts of the body overflowing to the intercostal muscles or inhibiting the normal diaphragm movements so that the breathing is entirely intercostal.

The quality of the resulting speech is inevitably very variable among athetoids and the pitch likely to be irregular, both quality and pitch depending on the degree of tension which is present. Among spastics, the quality in itself is apt to be poor, but fairly constant, while the pitch often has a rising tendency. Fluency disturbances, due to abnormal breathing patterns, are also seen in the separation of syllables by unusual intervals, with a consequent interruption of the normal syllabic pattern, in slurring intonation, jerky rhythm, or explosive speech. Among athetoid children such defects are often accompanied by facial grimaces or concomitant movements in other parts of the body. With difficulty in initiating and controlling movement in the articulatory mechanisms, there is often associated a difficulty in swallowing (dysphagia) and imperfect salivation control. These latter difficulties are met with particularly among those with quadriplegia.

Some indication of the extent to which dysarthria, anarthria and developmental delays are found among children in the different cerebral palsy categories may be given in Table XXV, which shows the percentage incidence of these three aspects of abnormal speech development found among a sample group of 500 children between the ages of 4½ and 14 years.

In a New Jersey (1938) survey of 146 cases,[44] speech defects were found in 57 per cent. of the group, but in 1946 Perlstein[56] estimated that the proportion was more likely to approximate to 70 per cent., an impression which our own findings tend to support.

The very high incidences of defective speech, language developmental delay and, in a not inconsiderable proportion, an inability to speak intelligibly by school age or even later, introduce yet another complication into a situation which, from an educational aspect, is already cluttered with profound difficulties.

TABLE XXV

Percentage Incidence of Speech Abnormalities Found Among 500 Cerebral Palsied Children

C.P. Type	No. of Cases	Percentage Speech Defects	Percentage No Speech	Percentage Development Delay
Athetoid	83	71	14	48
Ataxic	35	86	20	60
Quadriplegic ..	185	71	22	42
L. Hemiplegic ..	30	37	3	30
R. Hemiplegic ..	34	91	29	56
Paraplegic	133	39	6	26
All types	500	63	16	40

Reading, in particular, must prove not only extremely difficult for many of these children to master, but a tax on the ingenuity of the teacher in finding appropriate means of instruction, since use of methods which involve verbal response to word recognition are often impossible for these children. There is difficulty, too, in checking accuracy of recognition and comprehension, particularly when a written response cannot be substituted for the verbal one, since very many of these children with the most incomprehensible speech are those also whose general motor control is most imperfect.

Among less intelligent, though apparently physically normal, children a tendency to poorer than average sound discrimination and faulty reproduction might be expected. M. D. Sheridan[65] in an examination of 100 boys and girls between the ages of 11 and 13 years, all with IQ below 70, found single speech defects in an average of 33 per cent. (the boys showing a higher incidence than the girls) and two or more articulatory imperfections in an average of 20 per cent. of these children.

Many of these defects were due in large part not only to blunted auditory discrimination but to the general clumsiness of motor control associated frequently with a poor mental level. There were, however, some of these children who, on further investigation, proved to have imperfect hearing. Among normal children, the same writer found a greater percentage incidence of speech defects among the lower age groups, and, in an investigation among unselected children attending elementary schools, found multiple defects in an average (for boys and girls) of 6 per cent. of 5-year-old children, 3½ per cent. of those aged 8 years and 2 per cent. of those aged 12.

Among the cerebral palsied children, we also found a lower incidence (53 per cent.) in the 8-year-old group than in the 5-year-old sample of whom 89 per cent. had defects. The tendency to a decrease in incidence was not, however, progressively maintained, for, among those aged 11 years and over, 73 per cent. had speech defects.

The continuance of a high incidence of articulatory defects among the older children was scarcely surprising in view of the fact that the percentage incidence of severe handicap was inclined to be higher among this group. For the most part they were those who, by the age of 11 years or more, had made insufficient progress to enable them to take advantage of existing educational provision.

Apart from this, however, it will be seen how very much more common a problem is that of speech difficulty among these children as a whole than among normal children, or even among those of poor mentality who have no concomitant physical defects.

CHAPTER V

APPRECIATION OF SPATIAL CONCEPTS

SUMMARY

Various authors have referred to the poor ability for non-verbal tasks found among brain-injured children. Attempts at circle and diamond drawing made by normal and handicapped children were compared and revealed a wide discrepancy in level of performance.

The Bender Visual Gestalt Maturation Test, given to a group of 35 cerebral palsied children, approximately half of whom were of average or better general ability, confirmed previous suggestions that among these children as a whole spatial ability was relatively weak.

Differentiation, within the group, between the performances of spastic and athetoid children produced evidence that the latter tend to show less ability than the former in tasks requiring spatial judgement.

Since the acquisition of basic educational skills depends as much on non-verbal as on verbal ability, the findings have a direct bearing on choice of suitable educational methods.

Although educability, on the whole, tends to correlate highly with verbal ability, it must not be forgotten that reasonably satisfactory progress in acquiring the basic skills of education depends also on other and non-verbal factors. Many children who appear to have fair verbal facility do not make the progress expected of them. In some cases the apparent facility is later found to be superficial only and not an indication of a true verbal ability. In the case of others whose verbal ability is proved to be at least average, difficulty in making progress appears to be due to a lack of that " spatial sense " which is needed to appreciate visual patterns. This spatial sense appears to play a large part in the process of learning to read and write and seems also to enter largely into the ability to manipulate numbers.

E. Evans Lord[40] gives evidence of the very common occurrence of specific disability among cerebral palsied children in non-verbal thinking; while Bender[2], Schilder and Bromberg[64], Strauss and Lehtinen[70], all mention that disturbances in gestalt are found commonly in cases with peripheral nerve lesions. Bender suggests that this is sufficiently explained by the fact that the higher centres of the cerebrum serve as centres of more intricate types of organization, with a tendency to localization of function in the cortical sensory fields. Groves

B. Smith[66] also touches on this point in a discussion of difficulties involved in the psychological evaluation of children with cerebral damage and relates it to disturbances in two types of growth in the central nervous system; (*a*) the development of pathways connecting cells (i.e., projection and association tracts), and (*b*) the growth of dendritic processes, e.g., the association between the cortex and pyramidal tracts where the pyramidal pathway connects the cortex with the spinal cord.

Whatever the cause, it is interesting to analyse the test results of a group of these children and to see whether, apart from the purely executive difficulties imposed by lack of motor co-ordination, there appears to be any indication of a common weakness in gestalt and in spatial orientation generally among these children. It should first be explained that, in evaluating any attempt at a test which involved drawing, the results were scored on the intended direction, proportion and orientation of lines, angles and figures rather than on the actual executive skill shown in producing them.

In most cases of fairly severe inco-ordination it was necessary to give more than the usual ample space for the performance of the test and to allow the use of large crayons instead of pencil. Further, with a few very severely handicapped children it was necessary to ask them to indicate from which point they wished to begin the drawing and, at each stage, in which direction and how far they intended lines to extend. In some cases it was necessary for the observer to steady a child's arm or even to act as amanuensis. In such cases where help had to be given, it was made quite clear to the child that no limitation or alteration in direction of lines would be made unless he himself indicated a stop or change of direction, making quite clear in which direction and to what extent change should be made. An analysis of results for some 200 children is given in Table XXVI. This table show the percentages of cerebral palsied and of " normal " (i.e., physically unhandicapped) children at each chronological age year from 5–14 who passed a selection of tests each of which depended on ability for visuo-motor co-ordination, visual memory or spatial orientation or a combination of these abilities.

The figures both for the handicapped children and for the " normal " children are abstracted from the performances of groups whose general mental ability ranged from the lowest to the highest. The cerebral palsied children included not only those with a relatively severe degree of impairment, but also some with only such slight and restricted handicaps that they were able to attend ordinary schools. In all the tests, without exception, the level of performance of the handicapped group, as a whole, is strikingly lower than that of the normal group. This would suggest that among the cerebral palsied children there is a marked tendency to failure in tasks requiring ability to analyse visual

TABLE XXVI

Chron. Age	L.V2 Folding		L.V.4 Square		L.VI 2 Bead Chain (1)		L.VI 6 Maze		L.VII 3 Diamond		L.IX 1 Paper-cut (1)		L.IX 2 Design (1)		L.XI 1 Design (2)		L.XIII 1 Plan		L.XIII 3 Paper-cut (2)		L.XIII 6 Bead Chain (2)		L.XIV 5 Direction (1)	
Years	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)	% C.P. (*a*)	% Normal (*b*)
5	17	82	17	67	15	44	15	52	0	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6	30	92	53	97	47	70	55	81	3	23	3	4	3	2	—	—	—	—	—	—	—	—	—	—
7	53	97	42	99	26	86	53	91	0	69	0	21	0	22	—	—	—	—	—	—	—	—	—	—
8	82	100	76	100	59	95	70	93	35	91	18	42	18	31	5	9	—	—	—	—	—	—	—	—
9	82	—	86	—	75	99	71	99	36	95	21	64	7	50	7	21	—	—	—	—	—	—	—	—
10	61	—	61	—	50	—	61	—	33	96	28	68	22	60	0	30	—	—	—	—	—	—	—	—
11	73	—	73	—	64	—	82	—	55	96	36	77	27	72	27	43	18	41	9	41	9	52	0	43
12	82	—	82	—	82	—	82	—	64	99	45	82	36	76	18	57	27	53	18	47	18	59	0	49
13	92	—	92	—	92	—	—	—	92	100	83	90	67	91	58	67	17	60	25	60	25	64	0	58
14	100	—	100	—	75	—	—	—	—	—	0	92	25	92	25	71	0	65	0	62	0	70	0	65

percepts into their elements and to maintain the correct relationship of these elements in any attempt at re-synthesis. There are indications of a general weakness in appreciation of gestalt and of a concomitant inability to manipulate abstractly ideas of spatial relationship and orientation. The generally poorer levels of ability found among these children would, of course, be expected to find expression in lower levels of performance in all directions, unless it could be shown that, in the majority of cases, there was a common irregularity of development, with a marked specific retardation in certain abilities. Even if this is shown to exist, however, the fact that, in general, ability for non-verbal memory and organization is poor among these children is a matter of considerable importance when methods of education are under discussion. Appreciation of spatial relationships, discrimination of figure and ground, accurate recall of figure outlines and the ability to reproduce them, are factors which play a part from the beginning in the acquisition of the three R's, no matter by what methods these are taught.

The maturation of the ability to organize visual percepts has, in the past, been studied and discussed at some length academically in the various schools of experimental psychology, especially those of Hering and Helmholtz, as well as more recently in relation particularly to the normal development of young children by such workers as Gesell,[23] Kuhlman,[35] Stutsman,[71] Goodenough[24] and others. Controversies as to whether appreciation of distance, angles and, in general, the perception of spatial relationships have, from the beginning, involved discussion whether the ability for such perception develops naturally from birth or whether it is acquired and fostered only through experience. For children with cerebral palsy in particular such discussions have not merely an academic but a practical importance in direct relationship to the degree of inco-ordination present. The greater the degree in which the appreciation of extensity is taken to depend on practice and experience, the greater the extent to which many of these children may be expected to lag far behind normal children of comparable age in perceptual discrimination and organization. In a large percentage of these children the ability for visual co-ordination is relatively weak and control of head movements even in the privileged planes (horizontal and vertical) is often poor, or constantly interrupted by involuntary movements in other directions, so that continuous scanning in one direction is not easy for them. In viewing the attempts of many of these children at copying angular forms in particular, we are reminded of the words of Bishop Berkeley,[3] discussing 240 years ago the various theories of perception then current, when he wrote :—

" Everyone is himself the best judge of what he perceives, and what not. In vain shall all the mathematicians in the world tell me that I perceive certain lines and angles which introduce into my mind the various ideas of distance, so long as I myself am conscious of no such thing."

With reference to the organization of visual percepts, many investigations into the normal development of children have provided evidence which exemplifies the theories expressed by several experimental psychologists and others. In particular we should like to draw attention to Köhler's [33] principle that " . . . Organization in the sensory field originates as a characteristic achievement of the nervous system " ; Wertheimer's[75] conclusion that to segregate parts of a visually perceived field into " wholes " and " groups " is a very primitive and spontaneous tendency, and Lashley's[36] opinion that the capacity to be sensitized to spatial and temporal patterns is a characteristic of integrated behaviour.

There is general agreement among the various authorities regarding the developmental levels at which the ability to discriminate between and to reproduce the more elementary " closed figures " matures. By 1½ years the average child can draw a vertical line in imitation and in response to specific request ; by approximately 3 years of age he can form the most elementary " closed figure", i.e., a circle, though in the preceding 6 months (between 30–35 months of age) this task is achieved by only one out of three children and, at an earlier stage (24 to 29 months), by fewer than one in ten. By between 4 and 5 years of age the average child can produce a square, maintaining fairly accurately the proportions of both lines and angles and avoiding undue perseveration in either a horizontal or vertical direction. Between 6 and 7 years, a further and very significant advance is made, inasmuch as there emerges the ability to achieve a more difficult analysis and re-synthesis of geometric figures (e.g., a diamond) which, though still " simple closures", require mastery over oblique strokes and angles less or more than 90°, a task which Gesell[23] and others found to present too great a difficulty at any earlier stage of development. The inability either to appreciate fully or to be able to deal with " obliqueness " and the necessary changes in the angles for some while (approximately 2 years) after a child has successfully dealt with equal lines enclosing right angles, and the general tendency, until a maturer stage is reached, to produce either a square or even an oval or round figure for almost any shape presented for copy, illustrates Köhler's[34] statement that behaviour is not merely the response of an organism to a stimulus, but to its own sensory organization of that stimulus. The child's conception of what he perceives is that of a much simpler organization than is conceived by an adult, and his response is accordingly simplified. This is a point to remember also in considering attention-span and the relative importance of what Dallenbach[15] and others have referred to as " attributive " and " cognitive " clearness of perception and which is related closely to Wundt's distinction between " perception " and " apperception." The ability for spatial orientation appears approximately by 7 years of age to mature sufficiently to enable such spatial relations as " obliqueness " to be not only perceived and differentiated, but consciously to be employed in the arrangement of materials. Vernon[73] refers to experiments by Koffka[32] and Haufmann[26] which indicated that " . . . absolute spatial orientation has developed fairly completely by that age . . . " This postulation is borne out by the characteristic failure of average children below the age of approximately 7 years to construct a diamond-shaped figure correctly orientated ; beyond this age improvement lies only in the direction of greater precision in motor execution. A diamond, though apparently simple, yet involves a more advanced stage of differentiation of spatial relationships and it is for this reason that the use of such a figure has considerable value in diagnostic tests.

In attempting to reproduce the most elementary organization of a figure, i.e., a circle, it is interesting to note how weak is this power of perceptual organization among cerebral palsied children as a whole. In the scoring of tests, the results of which are referred to below, it must again be emphasised that irregularities of execution were ignored, the criterion for credit being that a line should be made in a rotary direction so that the two ends should approximate to form as far as possible a closed circle. Elliptical forms were credited, as were also circles in which there was very nearly, but not quite, complete closure. The scores for 110 cerebral palsied children aged between 3 years 3 months and 7 years 10 months are presented below for comparison with the results obtained by Stutsman[71] from 232 children aged between 4 years and 5 years 11 months. Stutsman's results from children aged between 1 year 6 months and 3 years 11 months are also given. Table XXVII shows the percentage of physically normal and cerebral palsied children respectively who succeeded in the task of drawing a circle.

TABLE XXVII

Percentage Success in Circle Drawing. Normal and Cerebral Palsied Children

Experimental Groups	Age Groups in Years and Months										
	1–6 1–11	2–0 2–5	2–6 2–11	3–0 3–5	3–6 3–11	4–0 4–5	4–6 4–11	5–0 5–5	5–6 5–11	6–0 6–11	7–0 7–11
(*a*) Percentage physically normal children (Stutsman) . .	0	7	31	53	81	94	100	100	100	100	100
(*b*) Percentage cerebral palsied children (N.F.E.R. research)	0	0	0	0	0	24		55		61	64

The discrepancy, shown in the above table, between the performance of a " normal " group and that of the handicapped group is just as wide at this level of simple organization as it was seen to be at the higher levels involved in the tasks referred to in Table XXVI. Lord,[41] Wood,[41 76] and Shulman[76] all refer to disturbances in visuo-motor integration found among children with organic cerebral defect ; Lord, in particular, refers to the great difficulty experienced in copying figures with angles, even among those children showing relatively good intelligence on a verbal level, and Hoakley and Frazeur, it will be remembered, found the diamond-drawing test to be the only one showing significant differences in the performances of normal and brain-injured children.

Bender[2] in a study undertaken " to determine whether organic brain disease which tends to disorganize cerebral functions will reduce the sensory experiences to independent disconnected sensations, or to simpler levels of integration of whole figures," notes that " . . There is a tendency not only to perceive gestalten, but to complete gestalten and to reorganize them in accordance with principles biologically determined by the sensory-motor pattern of action. This pattern of action may be expected to vary in different maturation or growth levels and in pathological states organically or functionally determined."

In her study, Bender made use of nine of Wertheimer's patterns, used by him for research in visual gestalt psychology, and gave these patterns for copying not only to adults with functional and organic brain defects, but also to 800 ordinary and nursery school-age children, covering an age range of three years to 11 years. The results from the work of these children made possible a standardization of the test for children which it seemed might give interesting results if applied to a group suffering from cerebral palsy handicaps. It was possible to apply the test to only a relatively small number, 35 children in all, aged between 5 years 2 months and 15 years whose mental ages ranged between 4 years 4 months and 16 years 3 months and who had IQs between 66 and 146.

With the exception of three children considered too little handicapped for admittance, the subjects were all pupils at a residential special school for cerebral palsied children and, as such, represent a relatively highly selected group. They were, in the main, children whose degree of physical handicap prevented attendance at day schools for physically handicapped children and who had been considered likely to respond to the special education and physical therapy provided at a residential school established exclusively for children with their type of handicap. No child who was unable to control a pencil, chalk or crayon sufficiently well to register his intention was included among the 35, so that the percentage success results are not vitiated by the inclusion of subjects whose lack of motor control would in any case prevent them from scoring in accordance with their perception of the material. The results from the test are presented in the next three tables. Table XXVIII distributes the results in accordance with chronological age and visual gestalt maturation score; Table XXIX shows mental age against gestalt maturation level, and Table XXX draws together the results from the two previous distributions, taking the age of 7 years as the critical stage of visual gestalt maturation. This age, it would seem, from other investigations and from general experience, is approximately that by which the ability to organize percepts has

TABLE XXVIII

Chron. Age (yrs.)	Visual Gestalt Maturation Level								
	Under 5 yrs.	5 yrs.	6 yrs.	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs. and over	Total
5	—	1	—	—	—	—	—	—	1
6	3	0	1	—	—	—	—	—	4
7	3	4	3	—	—	—	—	—	10
8	0	2	3	1	—	—	—	—	6
9	0	0	1	—	—	—	—	—	1
10	2	0	2	—	—	—	—	—	4
11 and over	1	1	0	4	1	0	1	1	9
Total	9	8	10	5	1	0	1	1	35

TABLE XXIX

Mental Age Years	Visual Gestalt Maturation Level								
	Under 5 yrs.	5 yrs.	6 yrs.	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs. and over	Total
Under 5	1	—	—	—	—	—	—	—	1
5	2	2	—	—	—	—	—	—	4
6	1	2	1	1	—	—	—	—	5
7	2	1	3	0	—	—	—	—	6
8	2	2	4	1	—	—	—	—	9
9	1	0	0	2	—	—	—	—	3
10	0	0	1	0	—	—	—	—	1
11 and over	0	1	1	1	1	0	1	1	6
Total ..	9	8	10	5	1	0	1	1	35

TABLE XXX

Comparison of Percentage Incidence

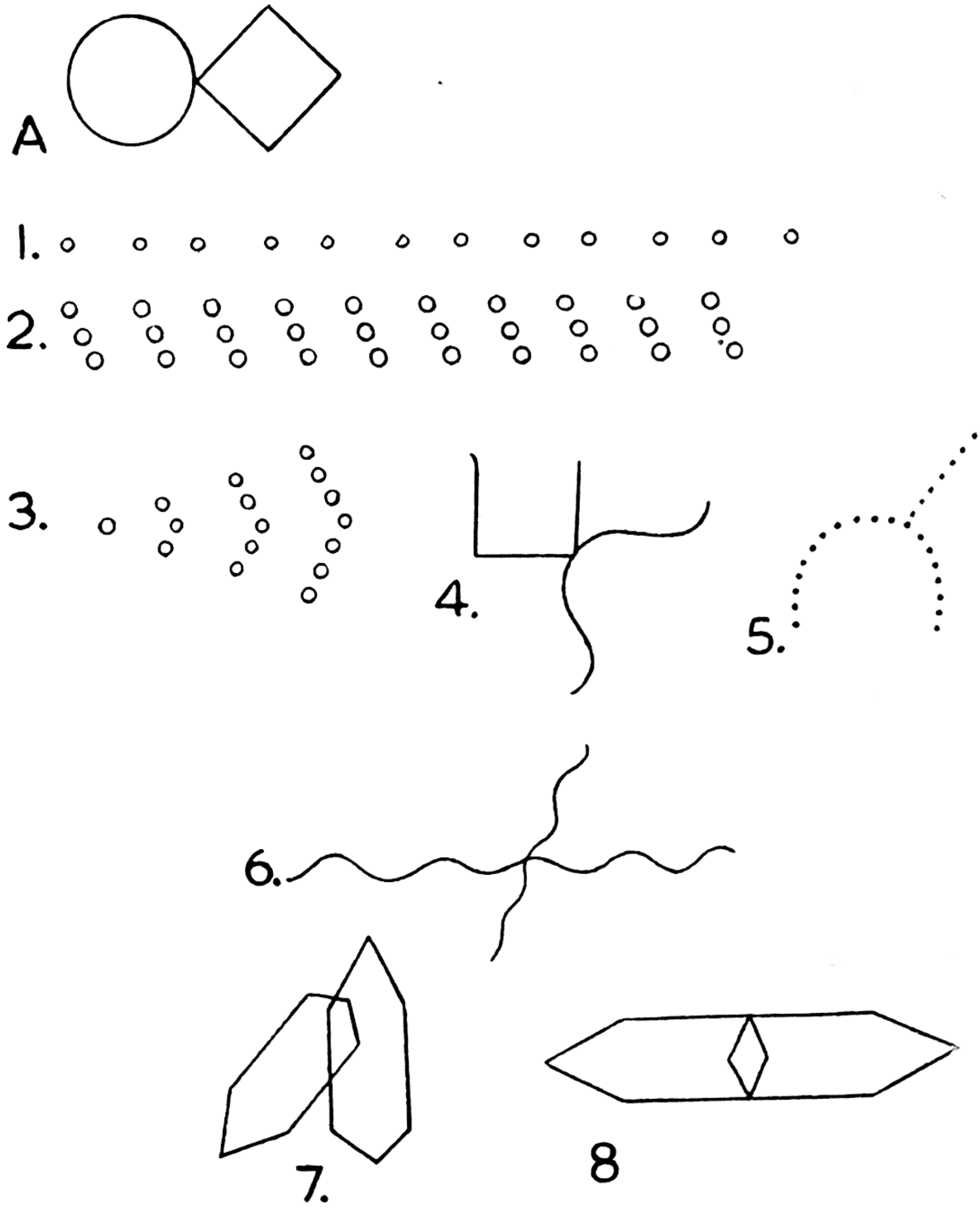
		Visual Gestalt Maturation Levels		
		% Under 7 Years	% 7 Years and over	Total %
Chron. Age	Under 7 Years ..	14	0	14
	7 Years and Over ..	63	23	86
	Total	77	23	100
Mental Age	Under 7 Years ..	26	3	29
	7 Years and Over ..	51	20	71
	Total	77	23	100

matured sufficiently for the demands made by the test to be fulfilled with a satisfactory degree of accuracy in the appreciation of spatial relationships.

Figure I illustrates the material used for this test. Figure II (1–5), which gives typical responses to the test, shows examples (1–4) from children who responded unsatisfactorily to education, (1) and (2) from spastic children, (3) and (4) from athetoid; while (5) is from an athetoid child whose educational response was fairly satisfactory.

From Table XXX it may be seen that, in spite of the fact that 86 per cent. of the group were of a chronological age of 7 years and over, 23 per cent. only were able to appreciate the demands of the test at a satisfactory level. The comparison of gestalt maturation level with mental age, which is of even more significance, shows only a slightly less marked discrepancy, with only a 20 per cent. success among a total of 71 per cent. of the children whose mental age was 7 and over at the time of the test, 30 per cent. of these children being actually aged from 11 to 14 years. From the point of view of the educational prospects of these children, there is significance in the fact that such marked weakness in the appreciation of spatial relations should be found in a group composed, with few exceptions, of the mentally most adequate children in the school, though the fact should not be ignored that, almost without exception, they were educationally retarded. It may, therefore, be of interest to show in Table XXXI the spread of actual ages in this group against the IQ levels and to compare this spread with the gestalt maturation levels shown against actual age and mental age in Tables XXVIII and XXIX.

Figure I



Figures from Dr. Lauretta Bender's Visuo-Motor Gestalt Test.

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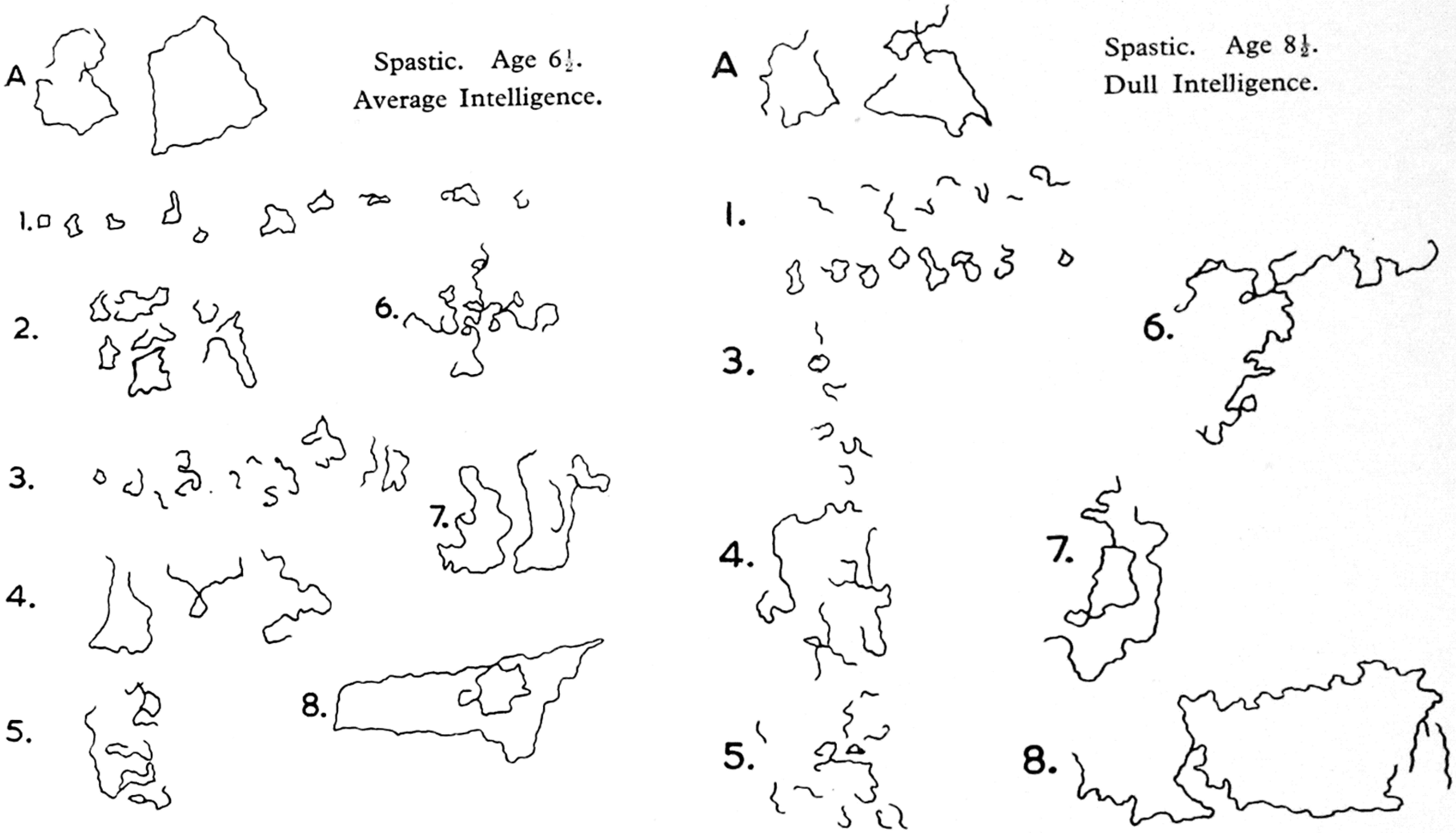
Figure II (1 & 2).



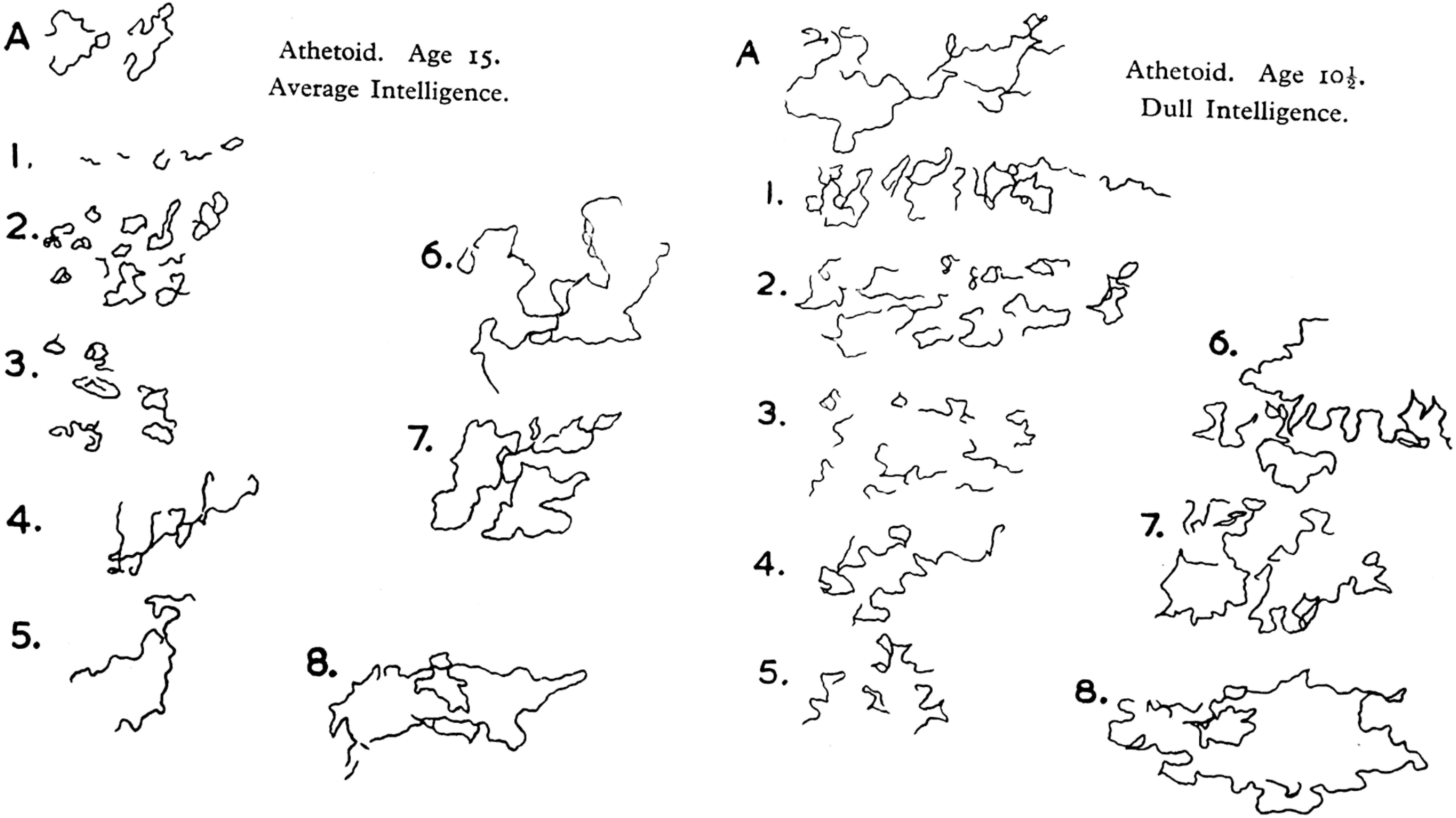
Spastic. Age 6½.
Average Intelligence.

Spastic. Age 8½.
Dull Intelligence.

Examples of Spastic Children's Performance. Visuo-Motor Gestalt Test.

(Note. Response to treatment & education poor in both cases, in spite of reasonably adequate intelligence.)

Figure II (3 & 4).



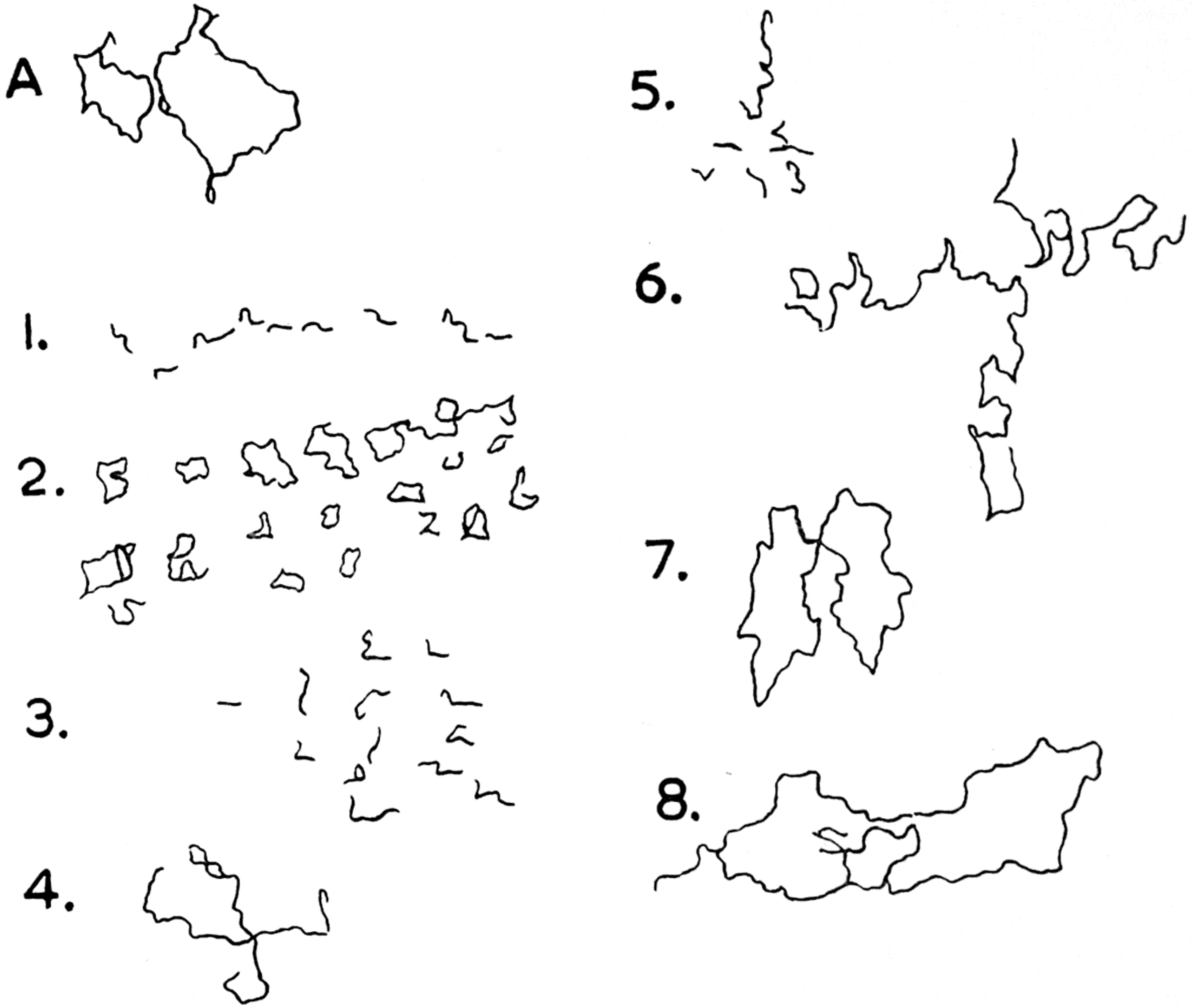
Athetoid. Age 15.
Average Intelligence.

Athetoid. Age 10½.
Dull Intelligence.

Examples of Athetoid Children's Performance. Visuo-Motor Gestalt Test.
(Note. Response to treatment & education poor in both cases, in spite of reasonably adequate intelligence.)

Figure II (5).

Athetoid. Age 8. Average Intelligence.



Example of Athetoid Child's Performance.
Visuo-Motor Gestalt Test.

(Note. One of few cases showing fair progress in treatment & education.)

TABLE XXXI

Scatter of Gestalt Maturation Test Group (35 Children) According to IQ and Chronological Age

Chron. Age	IQ Range							
	Under 70	70–84	85–94	95–104	105–114	115–129	130 and over	Total
5	—	—	—	—	—	1	—	1
6	—	—	—	2	—	2	—	4
7	2	1	2	1	3	1	—	10
8	1	1	3	0	0	1	—	6
9	—	1	—	—	—	—	—	1
10	—	2	—	1	—	—	1	4
11	—	2	1	—	—	—	1	4
12	—	—	1	—	—	—	—	1
13 and over	1	—	—	3	—	—	—	4
Total	4	7	7	7	3	5	2	35

It will be seen that 24 of the 35 children had an IQ between 85 and 130. Among the other 11, who were of generally lower ability, the physical handicap was either relatively slight in arms and hands, or was unilateral, leaving relatively full use on one side, it being in general against the policy of the school to accept pupils who had a marked degree of mental dullness in addition to a physical handicap which was either severe in degree or very extensive. Among a total of 30 children with a chronological age of 7 years and above (i.e., 86 per cent. of the whole group of 35), only 8 children (27 per cent.) could achieve at least a 7-year level on the test. Nineteen of these 30 children (63 per cent.) had an IQ level of 85 or over, but 6 only (20 per cent.) satisfied the test at a 7-year standard of performance.

If we take mental age as one criterion, we find that 25 of the group (71 per cent.) had a mental age of 7 years or more, but, of these, 7 only (20 per cent.) could achieve a satisfactory 7-year or better level of performance. Twenty of these 25 (80 per cent.) had IQs of 85 or better, but 6 only (24 per cent.) had a gestalt maturation age of 7 or above.

On general mental assessment therefore these children, in the main, should have proved reasonably educable, unless other factors in their handicap detracted from their potential educability. Yet the indications of the gestalt test are such as to suggest that a large proportion of these children, in spite perhaps of adequate verbal facility, are likely to experience considerable difficulty in the initial stages of acquiring the basic educational skills, particularly if the methods employed depend in too large a measure on the use of material requiring good spatial discrimination.

E. Evans Lord, in her research on cerebral palsied children, noted that such children often showed an immaturity in their spontaneous conversation within an examination period, in spite of, in many cases, a reasonable level of verbal fluency. She found, however, also that the rather poor ideational integration that was revealed in such cases was often linked with a relatively poor result on visuo-motor tests, with a history of poor concentration, and a poor level of execution in work which was within their apparent intellectual capacity. In discussing spatial disorientation in relation to educational progress, she notes that " It has special significance in the drawings of the children with cerebral palsy, particularly the spastic type, as it frequently persists in their efforts to write at school age."

In view of the frequent statements made by Phelps and others that the athetoid child has no disturbance of voluntary motor ability, but that the results of attempted motion by these children are distorted by

TABLE XXXII

Gestalt Maturation Levels : (a) Athetoids, (b) Spastics

Chron. Age		Maturation Levels		
		Percentage Under 7 Years	Percentage 7 Years and Above	Total Percentage
(*a*) Athetoids	Under 7 years ..	10	0	10
	7 years and above	80	10	90
Total		90	10	100
(*b*) Spastics	Under 7 years ..	12	0	12
	7 years and above	60	28	88
Total		72	28	100

Mental Age		Maturation Levels		
		Percentage Under 7 Years	Percentage 7 Years and Above	Total Percentage
(*a*) Athetoids	Under 7 years ..	10	0	10
	7 years and above	80	10	90
Total		90	10	100
(*b*) Spastics	Under 7 years ..	32	4	36
	7 years and above	40	24	64
Total		72	28	100

the involuntary motions which are present, it may be interesting to extract from the performances of the total group those respectively for athetoids and spastics to see whether there is in fact any indication of a fundamentally better orientating ability among the former. It is acknowledged that the data available are limited inasmuch as the whole group to which the gestalt maturation tests were given numbered only 35, of whom 19 were athetoid and the remainder spastic. It should also be noted that the ten athetoid children to whom the test was given were not the most severely handicapped among their category in the school, but were all capable of exercising sufficient motor control to avoid gross misrepresentation of their intentions. They were also all capable of drawing attention verbally to any errors due entirely to the sudden intervention of any involuntary movements. All the children were, in fact, asked after each performance whether their drawings were exactly like the copies ; where corrections were indicated, either spontaneously or in response to this question, such corrections were credited in the final assessment of their results. The spread of ability for the two groups (athetoid and spastic) is presented in Table XXXII, page 65, and, as in Table XXX, is shown both in relation to chronological and mental age.

It will be noted that, for the two categories, athetoid and spastic, the incidence of children with chronological age above and below 7 years varies only very slightly (10 per cent. and 12 per cent.), but that in the distribution according to mental age the variation in the incidence is more marked (10 per cent. and 36 per cent.). In spite, however, of this relatively higher incidence of poorer mentality among the spastic group, it will be seen that, among those spastic children with a mental age of 7 years or more, the percentage of those who achieved a 7-year or better standard of gestalt maturation was two and a half times as great as the proportion achieving this level among the athetoids (athetoids 10 per cent., spastics 24 per cent.). In the distribution according to chronological age, the difference is no less marked (athetoids 10 per cent., spastics 28 per cent.).

This evidence would appear to contradict the assumption so frequently made that athetoid children's intentions are correct, but they are prevented from carrying them out only because of the disturbing effects of their involuntary movements. Our evidence suggests that, if anything, in tasks involving spatial orientation and judgment, these children are far more handicapped than are spastics. This point has a very practical bearing on the choice of methods and apparatus used in attempting to teach these children the basic educational skills. Failure to appreciate the fact will entail much disappointment and discouragement not only among the children concerned but among enthusiastic but insufficiently informed teachers, who may spend many hours devising " concrete aids " for class-room work, only to find that, in many cases, progress will be hindered rather than helped by insistence on their use. This is not to say that such devices should not be available to these children or that they should not be encouraged to engage in activities and occupations which will give them practice in appreciating spatial relationships. They need such experience, if only because they are weak in this respect, but such practice should be encouraged, with some children certainly, at other times than in those periods devoted to the acquisition of the most elementary stages of reading and number. In reading, that is to say, many of these children may be found to respond to " phonic " rather than " sentence matching " methods and in arithmetic to methods which, for number composition and tables, depend on verbal memory ; in other words, it is sometimes advisable to use methods of teaching which would nowadays be considered old-fashioned.

CHAPTER VI

LATERALITY

SUMMARY

(a) Hand dominance. (1) Preferential use of either right or left hand and eye appears to be inherited. (2) Social convention tends to favour right-handedness, despite evidence that about one-third of the general population are naturally left-handed and that enforced shifting of preferential use may have adverse effects. (3) Investigation among cerebral palsied children showed that left-handedness is more than twice as common as among normal children. (4) A greater incidence of those reading and writing difficulties which are often associated with left-handedness may therefore be expected among cerebral palsied children.

(b) Eye dominance. (1) A simple test for eye dominance is described. (2) Results from testing large numbers of normal children showed left-eyedness to occur in approximately 40 per cent. The same test given to 264 cerebral palsied children showed 62 per cent. to be left-eye dominant. (3) Since certain educational difficulties tend to be found more commonly in association with left-eye dominance, the test findings suggest that, in the general educational retardation of cerebral palsied children, left-eye dominance may be a common contributory factor.

LATERALITY

A factor which, even in the case of physically normal children with educational difficulties, often receives scant attention, but which is of considerable importance in the case of children with a cerebral palsy handicap, is that of laterality, i.e., hand and eye dominance, or the selective preference for one side in motor acts which require the use of only one hand or eye. In school, hand preference may be seen in the use of pencil or chalk, in ball games and in table games such as draughts, ludo and others; while eye preference is shown in activities which require aiming and/or uniocular sighting, such as in using a gun, kaleidoscope, microscope, or telescope.

(a) Hand dominance. Laterality appears to have a strong hereditary tendency. Although social convention and habit frequently favour the right-handed and right-eyed individual and have led to pressure being exerted on many " sinstrads " to shift to right-side preference, those whose natural preference is marked are usually persistent in adhering to the naturally dominant side, at any rate for some activities. Such persistence, in the face of contra-suggestion, may lead to a period of difficulty during the acquisition of early skills. Further difficulties are apt to arise when suggestion and pressure eventually result in

suppressing a natural left-hand preference if this was originally fairly strong. The tension aroused in a child subjected to the conflicting demands of natural preference and social pressure may not only retard his acquisition of motor skills, but at an early age may have an adverse effect on speech development and may even be associated with executive speech difficulties, such as a hesitating delivery or actual stuttering. Where a child has, from birth, a motor handicap resulting in unilateral restriction, it is, of course, less easy to determine on which side the natural dominance would have been.

In some cases the physical handicap may be such that a shift has necessarily had to take place, because the naturally dominant side is too restricted to be of much use. Even in the case of children with a fairly marked degree of unilateral handicap however, an unusual degree of clumsiness in learning to use the other hand, a tendency for the handicapped hand to " mirror " the movements of the normal one, or a tendency to reach for an object with the handicapped hand in order then to place it into the unhandicapped hand for actual use, will sometimes suggest that the natural dominance is other than that usually displayed in habitual usage.

Where a cerebral palsied child receives physical therapy as well as school education, it is very important that there should be agreement between teacher and therapist regarding the child's dominant hand and the extent to which he should be encouraged to give it preferential use if it is handicapped. Without such agreement, not only may confusion arise in the child, with detriment to his progress in both departments, but actual harm may be done by imposing additional strain and tension which may retard any progress that the child might otherwise make. For the teacher to assume, without the necessary evidence, that the child is right-handed will often lead her to place material in an awkward position for the child, particularly when his handicap prevents him from adjusting apparatus to his own satisfaction and comfort. In determining the natural handedness of a child we need to take into account not only the results of any specific tests we may use, but also his developmental history. Though the latter is frequently misleading, as much on account of poor observation as of prejudice on the part of those who have previously cared for the child, such a history may give some indication of the stage at which preference was shown, the degree to which it was either encouraged or discouraged, the child's reactions to any discouragement, or his degree of acquiescence in accepting any efforts to enforce a shift. Many parents pay all too little attention to early signs in their child of a disinclination to use the right hand and so often unwittingly delay his progress to independence in such matters as self-feeding. They frequently insist on placing and replacing a spoon in the child's right hand, although again and again he will persistently reach for it with his left and may already have demonstrated his preference for this hand in holding a rusk or shaking a rattle or in some other early activity. There are, of course, other children on whom no pressure has been exerted who will, on first going to school, begin to ape the children around them. Many may, in spite of an already demonstrated left-hand preference and without suggestion from either teacher or parent, begin to use their right hands for holding chalk or pencil just because the majority of children around them are using that hand; such children, however, often prove to have only a weakly determined preference. Determination of handedness must therefore not be based entirely on evidence of habitual use, but should involve the use of test situations and the observation of activities as free as possible from the effects of handedness training and practice. Such activities as hair combing, tooth cleaning, using a handkerchief, picking up large and small objects, putting rings on sticks, shovelling sand into a bucket and dealing cards provide situations in which the question of social convention does not arise. In using such situations for dominance observation it is better that the child should not know the real object of the test and should not previously have been questioned as to his habitual usage. Not only will a handicapped child more often than not indicate his unhandicapped side as the preferred one, whatever his true natural dominance, but many children who have been subjected to rigorous training will be over eager to prove their obedience to past instructions, particularly when emphasis has been placed on the fact that to do so is "right." It is very unfortunate that the term "right" should have a moral as well as a spatial association, for the two can be easily confused in the mind of a child. Even among their parents there is often an unfortunate tendency to consider sinistrality as a defect to be eradicated as firmly and as early as possible, or as a stigma of which to be ashamed, or as something abnormal and to the discredit of the child and, of course, indirectly, of themselves. In such cases as these, whether or not a child is handicapped, it is often possible to allay the parents' fears by informing them of the proportion of left-handedness to be found among an ordinary population. In the case of a child with a right hemiplegia, but whose natural preference would in any case appear to be for the left side, it is well to point out both to the parent, and the child if he is of an age to comprehend, that the use of his left hand is natural to him and does not in fact mean that he is labouring under an additional handicap.

Unfortunately few reliable estimates of the incidence of sinistrality in the normal population are available. Few people have produced evidence from data which has not been biased by the fact that contact with the subjects of the investigation has originally been made because of difficulties of one sort or another already in evidence. The writer however has collected systematically, over a period of years, evidence* from thousands of children of all ages and including all types of mentally, physically and educationally normal children as well as those with a variety of combinations of defects and difficulties. From this mass of evidence, taking large samples of the normal population in different parts of the country and at different times, the proportional incidence of natural left-handedness was found to vary between 30 per cent. and 38 per cent. with an average incidence of a little over 30 per cent., although in more than half these cases the natural preference had been masked by training in those activities regulated by social convention.

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*Unpublished researches.

Among the cerebral palsied children the proportion who are naturally left-hand dominant would seem to be much higher than in the general population, and E. Evans Lord[40] in a study of 300 such children found that approximately 65 per cent. were more competent with their left hands than their right.

Our own data from 264 of these children, whose laterality was not only observed in usage but was tested, give a very closely approximating proportion of 66 per cent. with innate left-hand dominance, though only 47 per cent. habitually made use of this hand, the others having suffered training to a right-hand preference, or having shifted to an habitual use of that hand owing to the disability imposed by their handicap on the naturally dominant side.

As there appear no references in available literature regarding any differences in the proportional incidence of right and left hand dominance found respectively in the three main categories (athetoid, spastic, ataxic and other types), some indication of these differences is given in the following table.

TABLE XXXIII

Percentage Incidence of Left and Right Hand Preference Among 264 Cerebral Palsied Children of Various Types

C.P. Category	No. of Children	Hand Preference Percentage				
		L.H.	R.H. Shifted to L.H.	L.H. Shifted to R.H.	R.H.	Total
Athetoid	51	41	—	35	24	100
Quadriplegia	74	50	—	19	31	100
R. Hemiplegia	30	63	17	10	10	100
L. Hemiplegia	21	19	—	19	62	100
Paraplegia	60	43	—	19	38	100
Ataxias and others	28	43	—	18	39	100

One or two points of interest are revealed by the above distribution. In all cases, except those of left hemiplegia, the proportional incidence of innate left-handedness is remarkably high, varying from 61 per cent.

to 76 per cent., the highest incidence being found among he athetoid group. On the other hand, it is among children in this category that there occurs the highest percentage of masked sinistrality, 35 per cent. having shifted from a natural left-hand dominance to right-hand preference. A considerable proportion of these children therefore may be reckoned to have been labouring under an additional handicap imposed by a shift of habitual preference and many of them may well have been unduly retarded thereby in their efforts to establish a better degree of motor co-ordination and control. This is a matter of practical importance for the teacher and the data indicate how necessary it is that she should discover as early as possible which hand the child would naturally be using. Unless his handicap is such that tension is increased more by the use of that hand than the other, preferential use of the naturally dominant hand should be encouraged.

Among the right and left hemiplegia cases, as might be expected, there is a marked tendency for the preferential use of the left and right hands respectively since in these categories the motor control of one side is often so affected that the child is forced by circumstance to make a shift to the naturally subjugate hand. Nevertheless, it may be seen that among the hemiplegias was found much the same proportion of children as among the other categories who had shifted from their natural preference. Among the right hemiplegias, the 10 per cent. with the apparently rather surprising shift from left to right hand usage were, without exception, children with only a slight degree of handicap in their hands and on whom pressure had, in the past, been exerted to encourage them to use a right hand which had not been recognized as obviously spastic but which had been dubbed merely " a lazy hand." Even among the paraplegia cases, with no apparent disability of hands or arms and none discovered in the course of physical examinations, there was found a total of 62 per cent. of these children with a naturally left-hand preference, although in 19 per cent. there had been a shift induced, or their natural preference was largely masked by training. Incidentally, it should be noted that, among large samples of a normal population, the discovered incidence of an induced shift of preference was found in proportions varying from 16 per cent. to nearly 20 per cent. Why, among children with cerebral palsy, there should be this significantly higher proportion of those who have a left-hand dominance than among those in a normal population, even if we exclude those who have shifted from their natural preference, does not appear to have been explained anywhere. The cause does not actually concern us here, but the resulting high incidence of sinistrality is of practical importance to teachers. They must be prepared to make necessary modifications in some types of class-room apparatus and must expect to cope with a greater incidence of those difficulties in the early stages of reading and number which appear more frequently among children with a left-sided dominance. Such difficulties include often a slower progress in the correct formation of letters and numbers, a tendency to " mirror writing " and a slower progress in learning to spell accurately. It would seem almost impertinent to lay stress on the necessity for seeing that, where two children share a desk or table, the child using his left hand should not be in a position either to interfere with, or be interfered with by, a right-handed neighbour, but sufficient instances of neglect of such an elementary matter have been noted that mention is made of it here.

(*b*) *Eye dominance*

Hand preference is not the only laterality factor which may influence progress in the early skills, for eye dominance plays possibly as important a part. Eye dominance should not be confused with visual acuity; it is not a matter of refraction, but is a function of motor control dependent on the use of extra-ocular muscles. The " dominant " eye is that normally preferred when sighting an object with one eye only and is not necessarily the one which gives the better clarity of vision. Indeed, unless there exists a marked degree of difference in any refractive errors present in the two eyes, the eye preferred for sighting may even be found to have the greater error. The importance of right or left eye dominance for the child who is at a beginning stage of acquiring the basic educational skills lies in the fact (the reason for which has never been adequately explained) that children with left eye dominance have a tendency to scan material in a right to left direction. This tendency may produce effects similar to those seen in the case of a left-handed child. There occurs often the same " mirror " writing, but to an even greater extent may be found a tendency not only to write letters and figures " back to front " (static strephosymbolia), but also to reverse whole words (kinetic strephosymbolia), or to confuse the order of component letters of a word so that the child's efforts at spelling, though possibly containing all and no more than the necessary number and variety of letters, may result in an apparently meaningless and irrecognisable jumble. This state of affairs is found only in extreme cases. A surprisingly large proportion of children, however, who, in spite of adequate intelligence and verbal fluency, experience early difficulties in reading and spelling and whose reading rate tends to lag behind that of their general comprehension, are found on investigation to have a marked left-eye dominance.

" Eyedness," either right or left, in itself, as with most characteristics, appears to vary in degree from extreme to such slight dominance that little constant preference may be shown. The degree to which a left-eye dominance may act as a hindrance in learning to read, or in the process of improving the rate of fluency when accurate recognition is achieved, varies almost equally as widely. Were this not so, a great many more left-eye dominant children would show reading retardation than in fact actually do. As in the case of " handedness," a far greater proportion

F2

of people than is commonly supposed have sinistral dominance. From evidence gathered by the writer over a long period of years, there would appear to be approximately 40 per cent. of children in the general population who show preferential use of the left eye.

Where there is deterioration in the efficiency of the naturally dominant eye, a change of preference may be effected by sheer necessity, and, for occasional convenience in the use of some instruments involving "sighting," some people deliberately make use of the eye which is naturally subjugate. The still all too general tendency among parents, teachers and others, however, to enforce a transfer of habitual preference in children who are naturally left handed, does not occur in the case of eye preference. This may possibly be because the fact of eye dominance is less commonly known and because preferential use of one eye or other is less obvious than hand preference, except in special circumstances or in response to specific tests. Almost certainly, however, even if the matter of eye dominance were common knowledge, there would be fewer attempts at forcing a shift from left to right, since social convention apparently takes no more heed of those who care, for instance, to look through a telescope with their left eye than of those who prefer to bring it up to their right.

Among techniques used to test eye dominance, few have the reliability of the very simplest, the "peep-hole card." For handicapped children who have motor disabilities affecting the steadiness of hand or arm control, it is best for the observer to fix the card firmly on to a stand of suitable height so that the small central hole (approx. $\frac{1}{4}$-in. diam.) is about 4 inches distant from the bridge of the child's nose. The child is then asked to come close to the card and look through the hole to identify a small bright object held by the observer a short distance away from the opposite side of the card and in line with the hole. Most children will not hesitate to make instant use of the naturally preferred eye. A few, however, particularly among those with a very slight degree of preference, or with a very marked defect of visual acuity in the preferred eye, or a combination of both of these factors, will hesitate and look through the hole first with the one and then the other eye. In all cases it is best to give at least three and sometimes as many as six trials, holding up a different object each time. In the case of the child who shifts, viewing first with one eye and then the other, it is fairly safe to reckon that the eye first brought up to the hole, in the majority of instances over several trials, will be the naturally dominant one, and that any alternating of the viewing eye is either an indication of an extremely slight degree of natural dominance or else due to a marked defect in acuity of the naturally preferred eye.

Among a sample of 264 handicapped children, the proportions showing respectively left and right eye dominance are given in Table XXXIV in which the comparative percentage incidences for the six cerebral palsy categories are also differentiated.

TABLE XXXIV

Percentage Incidence of Left and Right Eye Dominance in a Cerebral Palsied Population: 264 Cases

C.P.	Percentage L. Eye	Percentage R. Eye	Total
Athetoid	65	35	100
Quadriplegic . .	66	34	100
R. Hemiplegic . .	70	30	100
L. Hemiplegic . .	43	57	100
Paraplegic	57	43	100
Ataxic and others . .	61	39	100
All categories . .	62	38	100

The proportional incidence of left-eye dominance among these children as a whole, as with left-handedness, is found to be rather greater than that found in an unhandicapped population. The prevalence of left-eye dominance in all but the left-hemiplegia group is found also, within relatively narrow limits, to be very similar in all categories. Here again then may be yet another contributing factor in the generally marked educational retardation of these children, which in many cases cannot entirely be accounted for on the grounds of their degree of physical incapacity alone, or of poorer than average intelligence.

Hand dominance and eye dominance are not necessarily found to be homologous. From the data obtained from large samples of the general population referred to above, we found that some 15 per cent. to 16 per cent. were naturally both left-handed and left-eye dominant; 37 per cent. had cross dominance, with either a natural right-hand and left-eye preference or a natural left-hand and right-eye dominance; while 48 per cent. had a right-sided unilateral preference for both eye and hand. Cross lateral preference, or " motor intergrading " as it has sometimes been termed,[48] may also retard progress in the establishment of skills which require hand and eye co-ordination. Whether the confusions which such " cross lateral " children sometimes exhibit are due to a form of " hemisphere rivalry " in itself, or whether to rivalry at the actual motor function level, we are unable to say, and are in any case at present concerned mainly with the effects produced. It will therefore be interesting to compare the incidence of cross-laterality among cerebral palsied children with that found in the general population. The relevant figures are given in the following table together with the proportions of children showing unilateral dominance (either left or right) for hand and eye.

TABLE XXXV

Percentage Incidence of Right and Left Dominance in Hand and Eye Found in a Cerebral Palsied Population : 264 Cases

C.P. Categories	Unilateral Percentage		Cross Lateral Percentage		Percentage Total
	L.E./L.H.	R.E./R.H.	L.E./R.H.	R.E./L.H.	
Athetoid	57	16	8	19	100
Quadriplegic ..	53	18	13	16	100
R. Hemiplegic ..	67	23	3	7	100
L. Hemiplegic ..	29	48	14	9	100
Paraplegic ..	38	20	19	23	100
Ataxic and others	50	29	10	11	100
All categories ..	50	22	12	16	100

If we compare the above distribution with that found among large samples of a general population, we find that the greatest difference lies in the proportions found respectively in the two unilateral classes, although some difference also appears in the total proportional incidence of the two types of cross-laterality which appear more commonly in the general population (37½ per cent.) than among the handicapped children (28 per cent.).

TABLE XXXVI

Percentage Incidence of Right and Left Dominance in Hand and Eye Found in Large Samples of a General Population : 6,733 Cases

	Unilateral Percentage		Cross Lateral Percentage		Percentage Total
	L.E./L.H.	R.E./R.H.	L.E./R.H.	R.E./L.H.	
Unselected population	15	48	24	13	100

CHAPTER VII

SENSORY DEFECTS

SUMMARY

(*a*) *Vision.* (1) Visual defects were found among nearly one third of 575 children with cerebral palsy (all categories). (2) This high incidence suggests a need for especially clear reading material and for reading methods which help children to focus. (3) A prevalence of convergence defects among these children may partly explain their generally poor spatial ability. (4) The common tendency both to visual defects and sinistrality suggests that cursive rather than script writing should be taught.

(*b*) *Hearing.* (1) Where response to speech therapy is unusually slow, an executive difficulty is often found to be aggravated by a hearing defect. (2) Some children have deafness only for certain tones and, among more intelligent children in particular, this defect is often unrecognized. (3) Pure tone audiometer tests were given to a group of children, most of whom were having speech treatment. (4) 85 per cent. of these children were found to have a more than 10 per cent. hearing loss; 18 per cent. having a more than 20 per cent. loss. (5) In most cases the loss appeared to be due to a defect at a central neurological rather than at an organic level. (6) Among athetoid children was found a higher proportional incidence of defect than among children in other categories. (7) The high incidence of defective hearing among these children aggravates the problem of teaching them.

(*a*) VISUAL DEFECTS

Apart from the question of eye dominance as a factor influencing rate of progress, we need also to consider that of the existence of actual visual defects, including defects of muscle control as well as those of refraction. It will not, unfortunately, be possible to consider the two separately, or in great detail, owing to lack of necessary differentiation in available data. The most striking fact about cerebral palsied children as a whole is the number who exhibit poor convergence, whether or not they have any marked degree of either a constant or an alternating squint. In the following table, the percentage incidence given for visual defects refers to squints and such instances of poor convergence as were patently obvious, nystagmus and such refractive errors as necessitated the wearing of glasses. From general observation of many of the children, it would seem probable that skilled testing would have revealed a rather higher percentage of relatively poor convergence ; the figures given in the table must therefore be considered as very conservative estimates.

TABLE XXXVII

Percentage Incidence of Visual Defects Among Cerebral Palsied Children : 575 Cases

C.P. Categories	Percentage Incidence					
	Athetoid	Quadriplegic	Hemiplegic	Paraplegic	Ataxic and Others	All Categories
Percentage incidence	28	28	28	33	26	29

We have no comparative figures for an unselected normal population,* but it seems unlikely that the incidence of poor convergence and visual defects among the normal population would approach to anything like the proportion of almost one in three found among cerebral palsied children. Why the incidence among the paraplegic group is approximately 5 per cent. higher than in the other categories we are unable to say ; we merely draw attention to the fact.

This high incidence, showing relatively little variation between the handicap categories, is yet another factor which must be taken into account in considering both the tendency to educational retardation among these children and also the matter of their educational equipment.

Inability to converge the eyes in binocular vision involves fatigue and difficulty particularly in following lines of print, even if the actual visual acuity in each eye is fairly normal. Consideration of the relatively high incidence of difficulty among cerebral palsied children, suggests that there is probably a good case for the introduction of books for these children in which rather more than the average space is left between successive lines, even though the actual size of the print may be no larger than usual. Even if it is not possible for such books to be made available, some relief may be given to the difficulties which convergence defects produce if slotted shields of thin cards are used and placed over the page so that all but the line actually being read is occluded. Any resulting break in sentence continuity, when this is carried over to the next line, should be more than compensated for by an increase in the rate of reading and comprehension when fewer delays occur in " finding the place."

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*The only comparative figures available are those for blind and classified partially-sighted children among "registered pupils"; the respective incidences are 0.02 per cent.–0.03 per cent. and 0.1 per cent. (M. of Ed. pamphlet 5 S.E.T. 1946).[77]

One other suggestion regarding teaching method may with relevance be offered here. With the high incidence both of sinistrality in hand and eye dominance and of cross-laterality found among these children is associated a marked tendency to make " reversals." Both " static " and " kinetic " forms are found. The former occurs when there is confusion in the recognition of letters, particularly those which are alike in shape but differ in orientation, e.g. b, d, p, q ; the latter when a series of letters or words in which a progressional element enters is mis-read, or when a whole word is read backwards, e.g. " was " for " saw." In view of the prevalence of convergence defects and this common tendency to reversals, there appears to be a strong case for teaching, from the start, a cursive style of writing rather than script.

Not only is much confusion thereby obviated, but the kinesthetic patterns of words are more readily acquired, an important matter with children whose spatial sense is on the whole rather poor. It is possible that the high incidence of poor convergence may be an active factor in the relatively poor appreciation of spatial relationships found among these children, but further investigation needs to be made to determine to what extent this is so. We can however, from observation, say that convergence defects add to the difficulties which many of these children find in attempting to space and align accurately aids, such as counters and sticks, which are commonly used in the early stages of number work, and in attempting any task which involves the fitting of one object into another, such as is frequently met with in activities for which many educational toys are devised.

(*b*) Hearing Defects

In many cases it is found that patient and skilled work on the part of a speech therapist may reduce considerably many imperfections of speech exhibited by cerebral palsied children, though progress is rarely very rapid. However, where treatment has been given over a considerable period, among the more intelligent children it has been obvious that the time and effort expended have been well worth while.

There remain, however, many children whose response, even to the most skilled therapy, has been either extremely disappointing or so patchy as to suggest that the motor difficulty is not alone the cause of poor progress. A child who, in spite of every effort on his part, will continue to reproduce speech faultily will often, on further investigation, show inability to perceive certain sounds. Since a child can only reproduce what he can hear, in such cases the continuance of faulty articulation is only to be expected. Inability to perceive, or to appreciate, differences in the quality of sounds of certain frequencies must inevitably result in elision or mutilation of such sounds when these occur in the child's own speech and in failure to comprehend readily what is said by other people.

To some extent we all, at certain times, are dependent on our ability to supply sounds which in fact we have not actually heard, or have heard incorrectly. In the course of telephone conversations in particular we are, more often than not, unaware of the extent to which we do this, since only 70 per cent. of speech sounds are actually transmitted. We are able to supply the missing sounds only, however, because our speech patterns are already established and we therefore have clues to what we should have heard. We become accustomed to individual peculiarities of intonation or accent among those whose speech is familiar to us and it is usually only when we are listening to unfamiliar speech (particularly on the telephone) that we are aware of difficulty in distinguishing between certain sounds which the telephone mechanism cannot convey as perfectly as we sometimes expect that it should.

Certain types of deafness, or partial deafness, which result not from organic ear defects but from structural abnormalities or damage at a neurological level, enable some sounds to be heard correctly and without amplification, but others to be either not heard at all, heard only with difficulty unless amplified, or not discriminated from sounds of other frequencies. Such difficulties are met with more often in listening to sounds of higher pitch than to those in the lower frequency ranges. In supplementing what we have actually heard by sounds which we have not actually perceived, but which we know or think have been made, intelligence plays a considerable part in the facility with which the gaps are closed. Among children with a reasonably good mentality a surprising degree of partial deafness to certain pitches may be found on audiometric examination. These children may often have gone for years without showing any more indication of their hearing loss than perhaps a tendency to reproduce badly such sounds as "s", "t", "d" and "th", occasionally to omit weak vowels or, in the case of the shorter vowels, to make substitutions and to omit one of two consonants coming together when both should be sounded. To some extent, of course, such omissions are found among normal children at early stages of speech development (e.g., "t'ain" for "train", "muvver" for "mother", etc.). In the ordinary course of development, however, these imperfections, which are signs of immaturity rather than speech defects in the true sense, are gradually eliminated unless the child's environment is such as to perpetuate these lapses from an accepted standard of speech. O'Brien [50] (New York) mentions that she found hearing defects among 10 per cent. of cerebral palsied children but does not say whether this percentage represents an incidence of such obvious loss as could be noted without specific investigation; nor is it clear whether this percentage was found among a total group of children with disabilities varying from a negligible to a severe degree of handicap, or whether it referred only to a proportion of those with a marked degree of motor disability.

It seemed likely that interesting information concerning the incidence of hearing defects among children who, on the whole, by reason of their disability, had so far been unable to avail themselves of other existing educational provision, could be obtained from a group of children at a residential special school exclusively for those with cerebral palsy handicaps.

Among the 38 children who were at the school, 23 were at that time receiving speech therapy. Since it was possible to obtain the loan of an audiometer for a limited period only, it was decided that audiogram records should first be obtained from these 23 children and such others as time permitted included later. Eventually it was possible to obtain records for only four other children, the results from two of these suggesting that records for the whole school might have provided some interesting data, had time permitted a complete investigation.

The actual process of obtaining what could be considered reasonably reliable records for these children was a long and tedious one. Due regard had to be given to their more than average fatiguability and to the fact that they were capable of sustained concentration for only very limited periods, so that frequent rests were necessary. Headphones were used, one phone being a dummy, so that records for right and left ears were taken separately. Previous experience with children with severe speech and hearing defects suggested that the ordinary reaction key or light signal should not be used, but some other method of signalling by the children substituted. With some of the children it was possible to use a small flag which could be raised or lowered with little effort and had proved the most successful means of response among children at a school dealing with speech defects. The involuntary movements of some of the children, however, made it necessary to find an alternative method which, when used, was also found to be more suitable for younger children. For this method, a brightly coloured ½-inch wooden cube was firmly fixed with cellophane tape to the table at which the child sat, the position of the cube being adjusted for each child individually to allow for differences in preferred hand, length of child's arm and most comfortable resting position. The children using this method of signalling were instructed to cover the cube with one hand until they could hear the sound from the instrument, which most of them designated " the wireless." On hearing the sound, they were instructed to uncover the cube and to leave it uncovered until they could no longer hear the sound. The children were warned that sometimes the sound would be like a high whistle and sometimes like a cow's "moo", the latter sound being very familiar to these children who could see the animals on a neighbouring farm from their class-room and dormitory windows. The children were also told to listen very carefully as sometimes the sound would be very small and sometimes quite loud ; that sometimes it would last only a short while and sometimes longer, and that the intervals between stimuli would also vary in length. Before any actual recording was done, each child was practised in the technique. For this purpose a sound of frequency and volume which could be heard by each child without effort was first used to accustom the children to the apparatus and to the method of signalling responses. In later practice periods, the same frequency was used but the volume was varied to accustom the children to listen for sounds approaching their individual thresholds of perception. As none of the group had experienced audiometer testing before, the proceedings were accepted as something in the nature of a novel game, and it seemed well to foster this attitude and to stop recording if children showed any sign of fatigue or exhibited any other signs of flagging interest or attention.

A Maico discrete frequency pure tone audiometer was used, with 9 octave and semi-octave tones of C, viz., 64, 128, 256, 512, 1,024, 2,048, 5,792, 8,192 and 11,584 cycles per second, all of which were given as stimuli to each child during the actual recording sessions. Tests by air conduction only were made, there being insufficient opportunities for using the instrument to allow for the carrying out of bone-conduction tests.

During the preliminary practice sessions, although no actual audiograms were made, it was possible in many cases to get some idea of degrees of defect, of defect at the practice frequency used for each child, and of any tendency to an over-long reaction time to sounds above the child's threshold. The matter of reaction time seems of considerable importance with these children, and to have ignored the often large differences between individuals would have invalidated many records. It was necessary with these children not only to allow ample time for them to become aware of the stimulus sound but also ample time to signal their awareness of it. Many of them had already demonstrated a tendency to a very slow reaction rate in circumstances other than those requiring a motor response. Full recognition of this tendency is important not only in such matters as making records of auditory acuity, but in all circumstances in which some response from the child is expected, whether this be in school, at home, or during special treatment. In giving the tests, a method was employed which had been advocated by Harvey Fletcher,[19] Bunch [7] and others and used by Sheridan [65] in her investigations. By this method, the first tone presented had a frequency of 1,024 sound cycles per second ; this, and subsequently the higher and then the lower frequencies, was given at a volume (measured in decibels) which could very easily be heard. The volume was then decreased at 10-decibel intervals until the child could no longer hear any sound, then gradually increased at 5-decibel intervals until he was again able to respond. Over the whole testing period for each child, this procedure was repeated at least four times and in some cases five or six times at each of the frequencies over the range 64 c/s to 11,584 c/s in order that as great as possible accuracy should be ensured. Such a proceeding, even for as few as 27 children, is very time consuming, but it is unfortunate that, in the more usual circumstances when audiograms are obtained for children, neither such an exhaustive procedure nor the preliminary practice periods can generally be undertaken. Where the necessary time can be given, however, the greater value of the resulting information is undeniable. Some investigators have considered that checking the "middle frequencies," as the most important for speech recognition, is sufficient. Kerridge,[31] for example, gives those at 512, 1,024 and 2,048 c/s as the most crucial, while others, in particular Dr. and Mrs. Ewing, (Manchester), who have studied the problem in all its aspects for many years, consider that a minimum range of from approximately 250 to 5,000 c/s is required for really accurate speech appreciation. For perfect hearing and for the production of speech with a pleasing harmonious quality, which involves the appreciation of and use of a wide range of undertones and overtones, good auditory perception over the entire speech range is undoubtedly necessary. Lack of acuity at the higher frequencies must almost inevitably result in a flat, toneless speech, since loss of perception at these levels deprives vowels sounds of their upper harmonics and distorts the production of double consonants and of such sounds as "s," "f" and unvoiced "th." Diminished acuity over the lower frequency ranges on the other hand tends to affect the production of these consonants to a less degree, but has the effect of weakening the force of vowels and in general resulting in a speech lacking in resonance.

Among the 27 children who were tested at the Special Cerebral Palsy School, only two could be said to have normal hearing, and, of these two, one had a very slight unilateral loss at three out of the four middle-range frequencies. The other 25 showed a variety of combinations of loss for both ears, both over the whole frequency range and, in some cases, with marked and increasing loss at the higher frequencies. Because of the wide variations in degree and type of acuity loss, it is difficult to present the findings for the group as a whole except rather crudely. Harvey Fletcher suggested a method of rough approximation in estimating "percentage loss" of hearing (average readings at 512, 1,024, and 2,048 c/s multiplied by 0.8), but as Bunch has pointed out, such a method may mask important differences in contour within this range and ignores any hearing loss at the two frequencies above this. An alternatively suggested method of estimating acuity as showing an "average loss" of x decibels has again the disadvantage of contour masking.

Nevertheless, among the group of 27 children at present under discussion, even the crude method of estimating "percentage loss" is not without use. The formula was applied to the readings for each ear separately for each child and the results classified in such a way that the result from the ear showing the greater loss was used in assigning a category. These results are presented below in Table XXXVIII, in which the three main types of physical disability are also differentiated.

TABLE XXXVIII

Approximate Percentage Hearing Losses Among 27 Cerebral Palsied Children

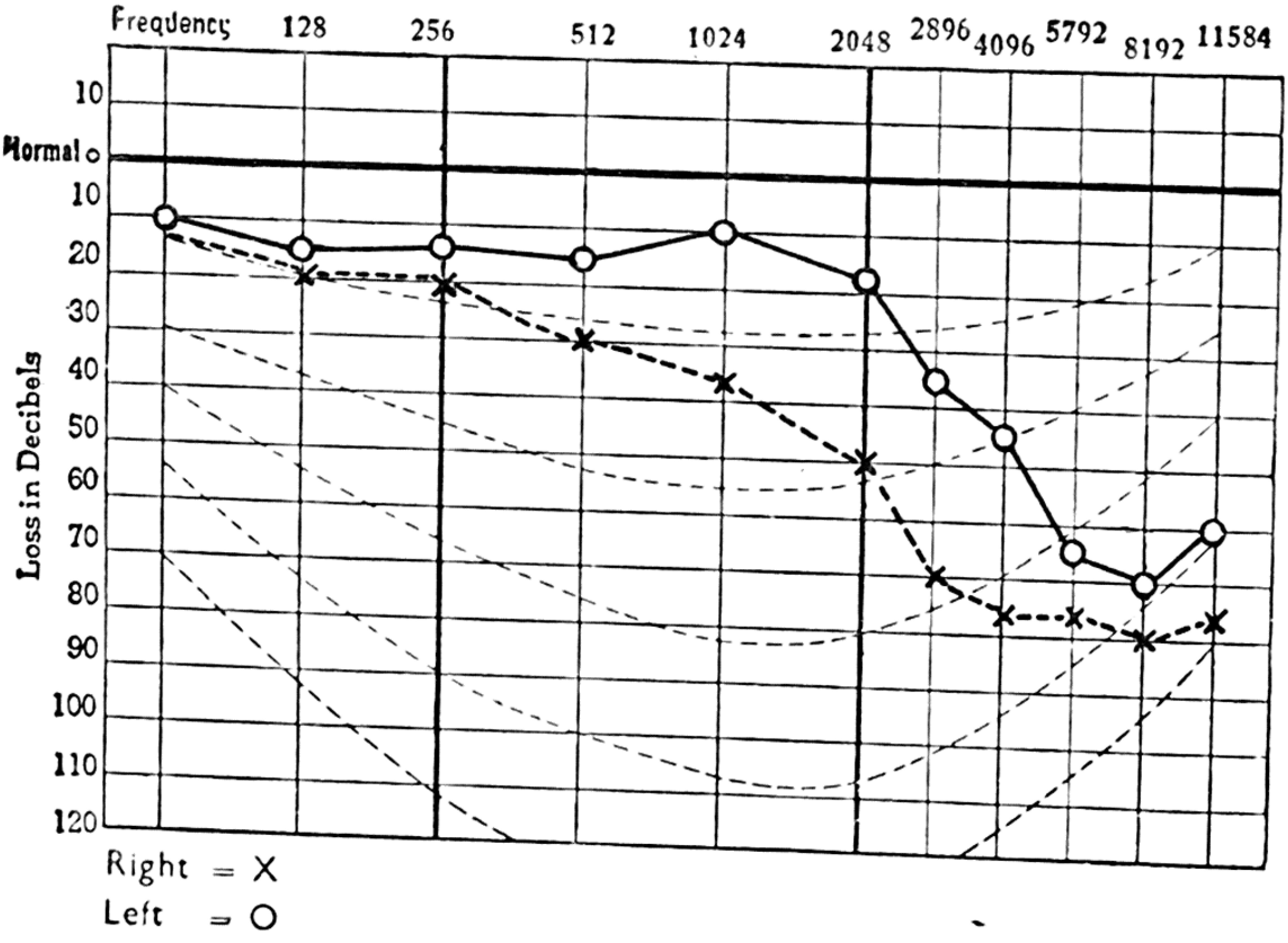
C.P. Type	Less Than 10 per cent. loss	10–20 per cent. loss	Over 20 per cent. loss	Total Cases
Athetoid	3	7	4	14
Ataxic	—	4	—	4
Spastic	1	7	1	9
All types	4	18	5	27
Percentage incidence	15	67	18	100

To some extent this approximation to " percentage loss " is likely to be more accurate among these children than if used among people with deafness of an organic or conductive type. With the exception of one child (a paraplegic), in every case the contours for the two ears were so close and so similar that it would seem that, in all except the one instance, the deficiency was due to " nerve " deafness or was at any rate due to some central factor rather than to faulty sound conduction due to middle ear defects. As may be seen from the table, a total of 85 per cent. of the children had hearing defects of more than 10 per cent., those with more than a 20 per cent. loss accounting for 18 per cent. in this total. It is scarcely surprising that all these children had speech defects, for, apart from the two whose acuity was normal and whose articulatory defects were of a " mechanical " type only, they all had sufficient loss to account for imperfect production, even without the concomitant difficulties imposed by their motor handicaps. As Sheridan[60] has emphasized, when hearing loss exists, even though it may be slight and something under 10 per cent. (which, as she points out is no great loss when an average conversation carried on at a distance of about 1 yard is spoken at about a 30–40 decibel level) it is " enough in the child whose speech habits have not yet had time fully to establish themselves, and whose auditory speech patterns are imperfect, to cause a disproportionately severe (speech) defect."

Of the five children showing a percentage loss of over 20 per cent., four were in the athetoid category, the other being a child with paraplegia and the only case with widely separated contours for right and left ear respectively. All five were cases showing extensive high-tone loss, three of the five (including the paraplegia case) also showing significant loss in the middle frequencies.

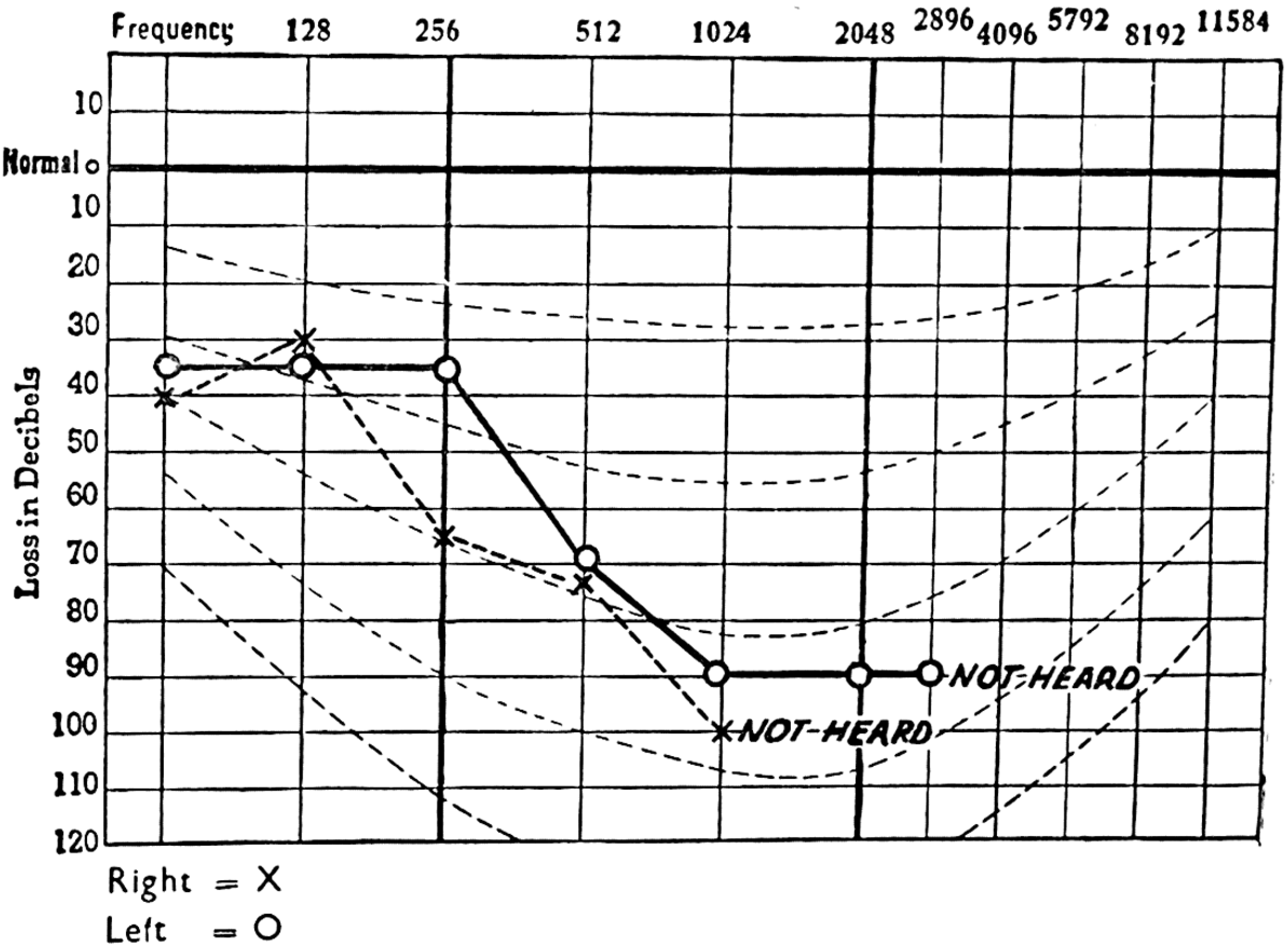
The difficulties which such children will have in learning and in responding satisfactorily, whether in school, in treatment or in their general social life, may be the better appreciated when it is realized that the ordinary " hearing aids " are of relatively little use to those with high-tone loss. Amplification sufficient to enable these tones to be appreciated would be such as to render the perception of sounds in the lower frequencies an impossibly painful experience.

Graphs 2 and 3 illustrate two cases of high-tone loss in athetoid children. In one (graph 2), a child of 12 of average intelligence, no hearing loss had been previously suspected. Although it had been observed that she was sometimes slow in response and that her speech was inclined to be " slovenly " this latter characteristic had been attributed in part to the influences of her home and of the district from which she came and where she had previously attended a day school for physically handicapped pupils. In her case, severe loss for both ears was recorded only above 2,048 c/s, although in the middle speech range (256–2,048 c/s) she had also an appreciable loss in the right ear. In the case of the other and younger child aged 7 years (graph 3), there was evidence of considerable retardation in all respects, physically and mentally. A marked timidity and lack of social response, which was probably aggravated by his poor physique and tendency to



Graph 2.

succumb to ailments, could well be explained in even greater degree by his extreme difficulty in hearing speech and, of course, in making himself understood. Even without his motor disability, he would have been a seriously handicapped child.



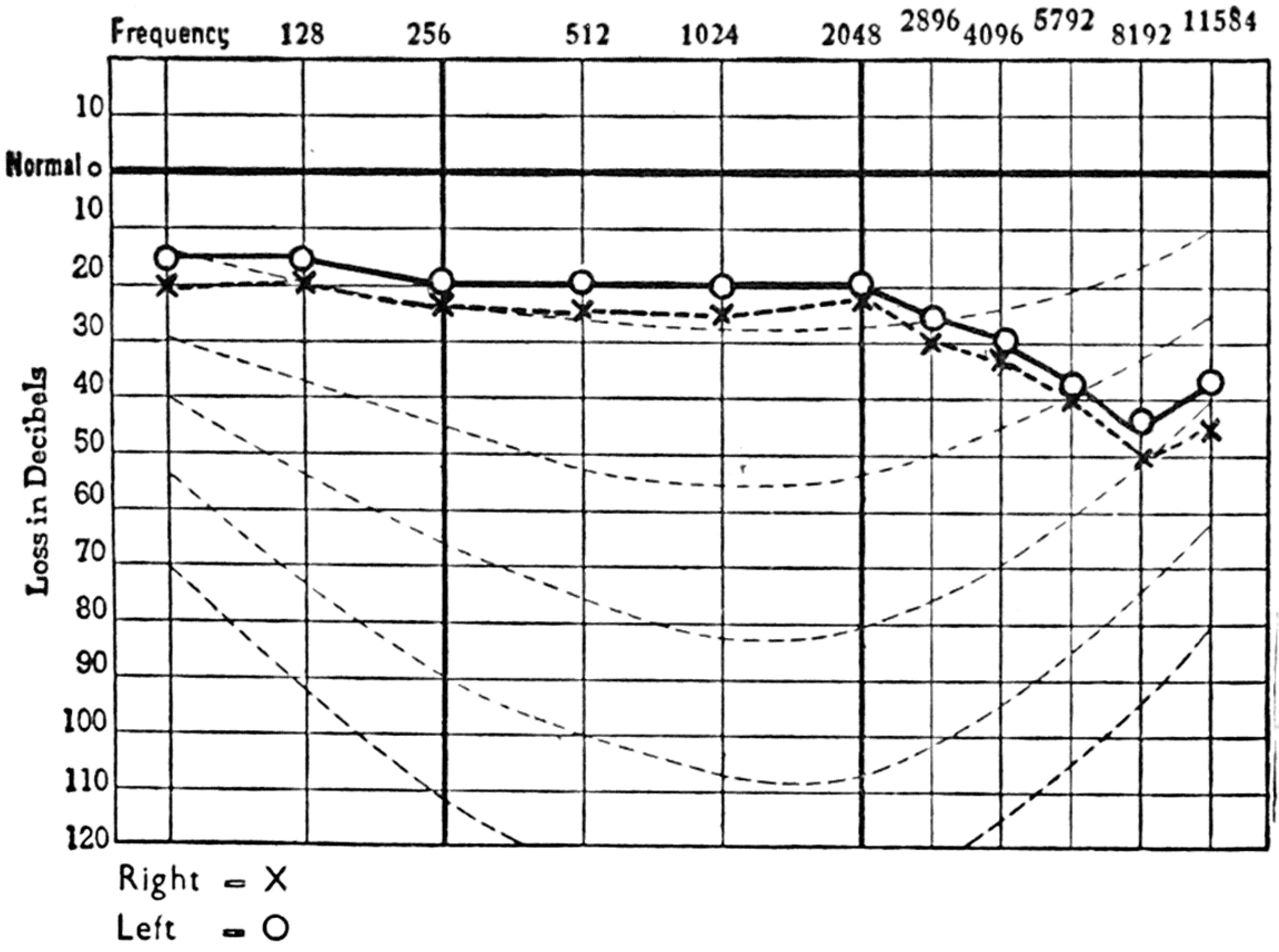
Graph 3.

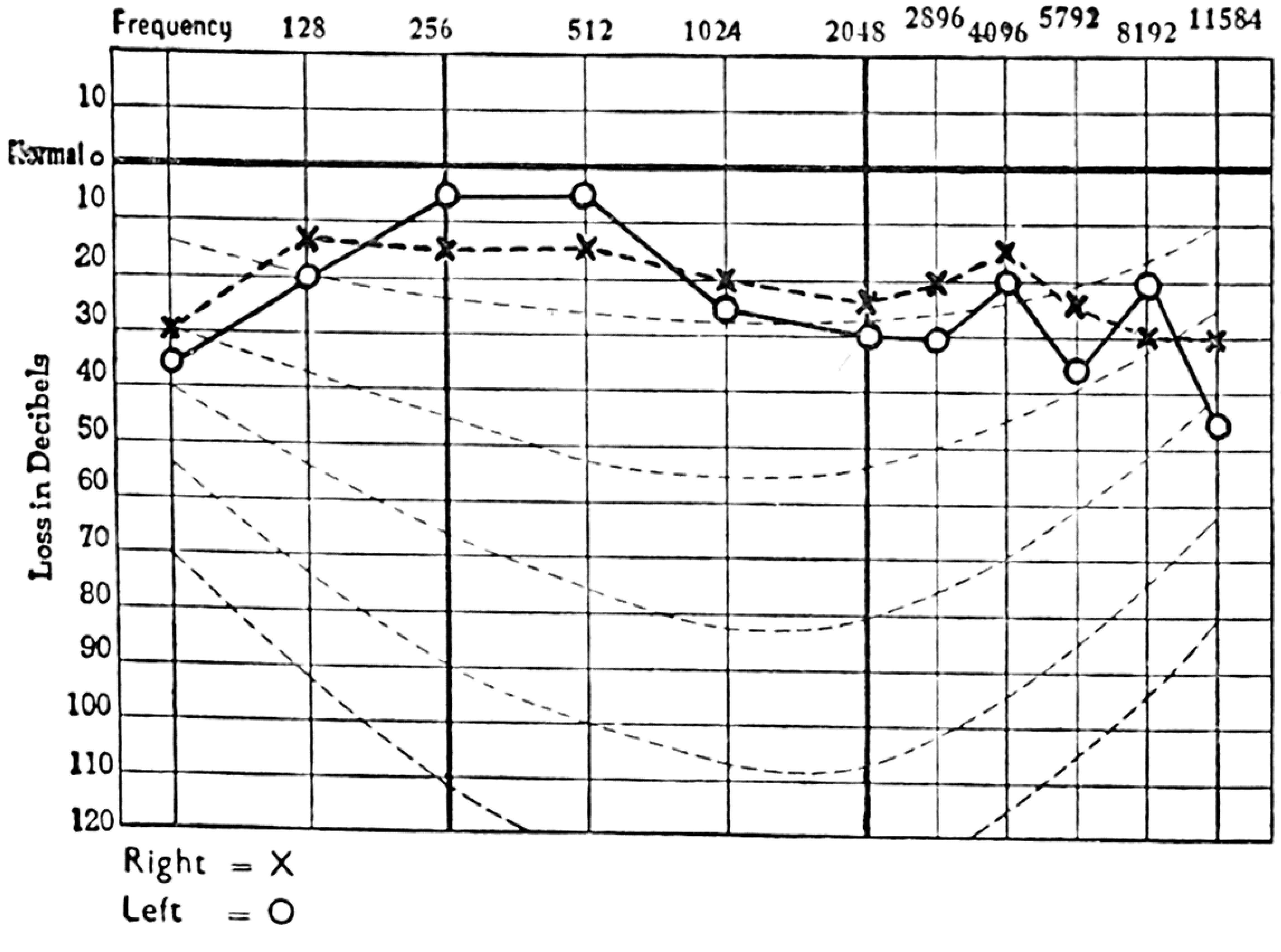
Among the 18 children with a 10 per cent. to 20 per cent. hearing loss, the audiograph contours were inclined to show an all-range loss of between 15 and 20 decibels, with a tendency to a slightly increased loss at the frequencies above 2,048 c/s. A typical pattern is that shown in graph 4.

In this same category of 10 per cent. to 20 per cent. loss, we also get records, such as that shown in graph 5, in which at half or more of the frequencies, mainly those above and below central speech range which affect the quality and resonance of speech, a decibel loss of 30 or more occurs. Although this happens in the particular case illustrated, the loss calculated by " percentage loss " method would, in this instance, be given as only approximately 16 per cent. It is interesting to note that the child to whom this audiogram record refers had a particularly thin, reedy voice of generally weak quality and without resonance, such as might be expected when perception of both lower and upper harmonics was so obviously reduced.

If we consider the results of the audiometric investigation among this group of 27 children, 23 of whom were receiving speech therapy,

GRAPHS 4 & 5


Frequency
128
256
512
1024
2048
2896
4096
5792
8192
11584
10
Normal 0
10
20
30
40
50
60
70
80
90
100
110
120
Loss in Decibels
Right = X
Left = O


Frequency
128
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8192
11584
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Normal 0
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70
80
90
100
110
120
Loss in Decibels
Right = X
Left = O

we find that, even if the remaining 11 children in the school who were not tested had all proved to have normal hearing, there would be an incidence of 60 per cent. of the school with a greater than 10 per cent. hearing loss. The fact however that, of the four children not receiving speech therapy, three proved to have hearing losses between 10 per cent. and 20 per cent., suggests the possibility that an even higher rate of incidence of hearing defects of significant degree might have been found had the whole school been tested.

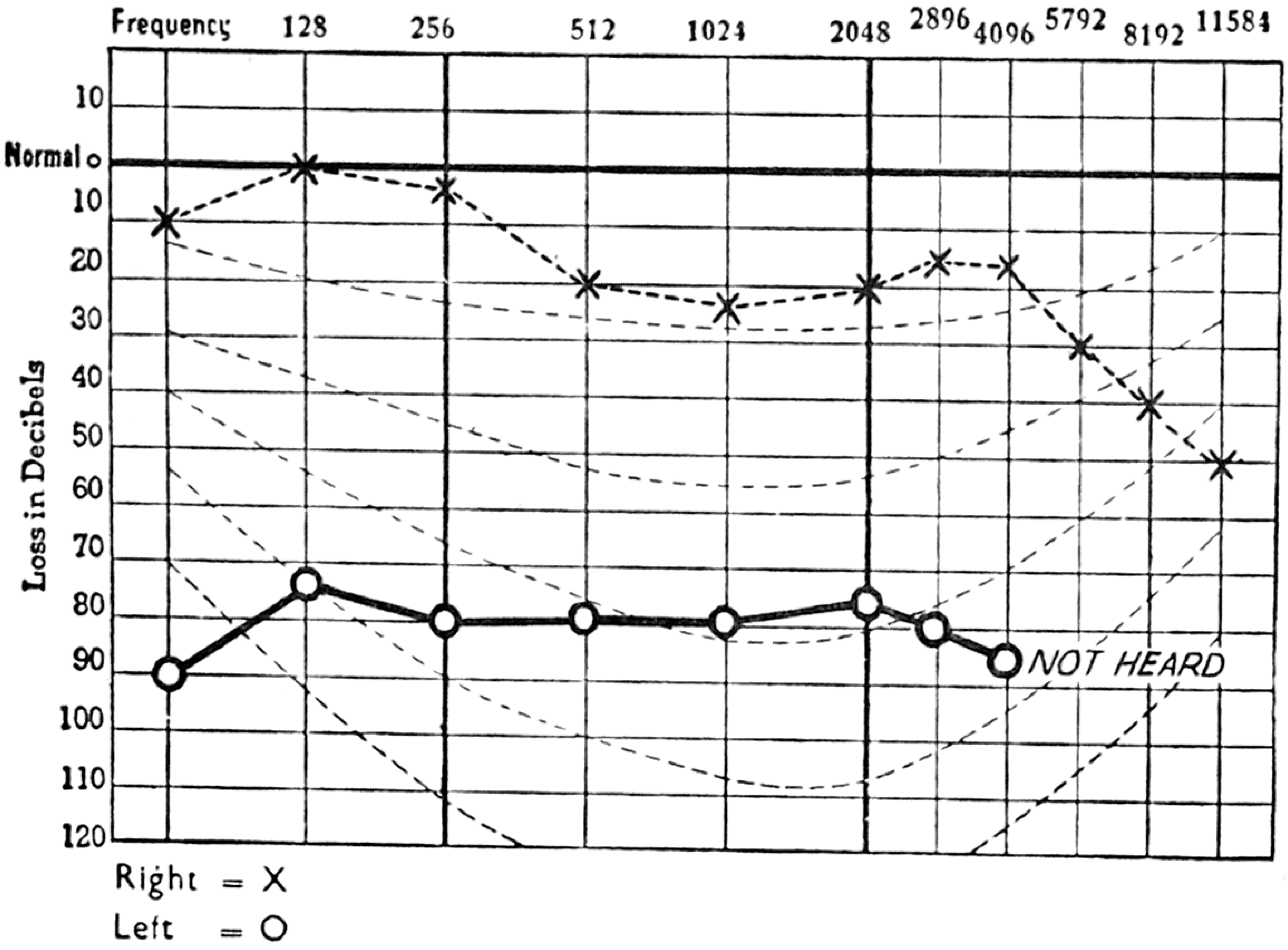
Among the 38 children who were in the school at the time of the investigation, there were 15 athetoid children, 19 spastics and 4 ataxics. Of these, the four ataxics all showed an all-range loss averaging between 10 per cent. and 20 per cent. with, in two out of the four cases, a tendency to further loss at frequencies above 5,792 c/s. Such additional loss, however, had probably relatively little effect on the general hearing for speech of these two children, though it might well have had some effect on the quality and precision of their own speech production.

Among the other two larger groups, athetoids and spastics, we found evidence of a proportionately higher rate of a more than 10 per cent. hearing loss among the athetoids than among the spastic group. Just over 73 per cent. of the athetoid children in the school had a 10 per cent. or greater loss, as against 42 per cent. of the spastic children. Further, of this 73 per cent. of athetoids, approximately one-third were cases of pronounced high-tone loss, including a proportion of one in four among whom there appeared to be almost complete lack of perception of tones with frequencies above 2,048 c/s. High-tone loss was not a significant feature among the spastic group. In three cases, however, there was a slight progressive loss of acuity for frequencies above 2,048 c/s, a loss of 15 to 20 decibels at the latter frequency increasing to a maximum loss of 35 decibels at the uppermost end of the whole range. In the case of the paraplegic child, referred to earlier, who was the only one to show a wide difference between the audiogram contours for the left and right ear respectively, hearing in the left ear was so minimal as to be probably of little use in general, so that the slightly decreased acuity for higher tones in the right ear was likely to prove a definite handicap.

The audiogram for this child is shown in graph 6.

This widespread incidence of significant hearing loss among the children at the school had undoubtedly not been realized by either teachers or others who were already trying to cope with a multiplicity of handicaps which the children presented. This further factor therefore introduced an added complication to the problem of appropriate teaching for such children and explained, in part, their poorly organized attention and generally slow response and forgetfulness.

In the classroom, the question of the use of broadcast lessons needs careful consideration, for it is doubtful whether they are of much value for some of these children. Certainly very careful consideration needs to be given to the constitution of listening groups. If the volume of sound is increased to enable those with an all-range loss to hear reasonably well, there is a danger that the resulting noise will be anything but pleasant for those with only a high-tone loss.



Graph 6.

On the other hand of course, whatever the volume, many of these latter children would in any case find difficulty in appreciating what was being said. Skilled adjustment of tuning and volume is particularly necessary for these children, a fact which is possibly insufficiently appreciated by those in charge, not only when children are listening to talks, but when the wireless is used solely as a means of entertainment. The question of appropriate volume involves not only the adjustment of mechanical amplification, but of the teacher's and others own speech production. Undoubtedly, in talking to these children, unusual care needs to be exercised in the matter of clear speaking and pitch control; any tendency to shrillness in those addressing particularly some of the children having the effect of aggravating both the child's difficulty and the teacher's task.

CHAPTER VIII

EMOTIONAL STABILITY

SUMMARY

(1) *Emotional lability* is a common characteristic of cerebral palsy and frank instability is frequently found. (2) A history of convulsions or seizures was found in 14 per cent. of cases among 796 children. (3) Intensive treatment, if too rigorous, is apt to impose strains which may result in emotional disturbance. (4) The heaviest incidence of convulsions and seizures was found among children of inferior intelligence, but signs of instability were also observed frequently among those of all intellectual grades. (5) In a selected group of cerebral palsied children at a special school, the incidence of instability was about ten times as great as that found generally in the population. (6) Where multiple disabilities already exist, personal stability is of the utmost importance if educational progress and social adjustment are to be achieved. (7) The advisability is questioned of keeping educable children too long exclusively with others who, though similarly handicapped physically, are mentally inferior.

EMOTIONAL STABILITY

We have considered so far a number of special aspects of the cerebral palsied child's general handicap which prevent and interfere with normal progress in learning. We have seen that defects in general intellectual ability, in verbal and non-verbal thinking, reasoning and memory, and in visual and auditory sense perception occur, both singly and in combination, with a far greater frequency among these children than among those in the population as a whole, thereby aggravating the motor difficulties. We have now to consider yet another type of handicap which is liable to make any response to education less satisfactory than might otherwise be anticipated. Several authorities have drawn attention to the conspicuous lack of emotional control found among cerebral palsied children. Their emotional reactions are indeed very like their motor responses, in that they tend either to be abnormally depressed, or to exhibit themselves with an unnecessary violence. Phelps, Lord and others have warned particularly those in charge of the educational and physical treatment of these children against imposing too great a strain on them by subjecting those whose stability seems poor to a too vigorous scheme of training. Attention has been drawn to the dangers inherent in any attempt to push such children beyond their physical and mental capacity.

E. Evans Lord, until recently, was probably the only worker to have studied a large group of cerebral palsied children intensively over a prolonged period from the educational and psychological points of view. Speaking of an apparently sudden move towards improvement, which some of these children show when admitted to a new environment or introduced to new apparatus, she wrote as follows: "There is no assurance however, that these initial gains are predictive of a constant rate of improvement over an extended period. There are unquestionably physical limits set by the injury, and emotional disturbances are the price of an attempt to force the child beyond his physical capacity."

Such emotional vulnerability has undoubtedly a constitutional basis in a proportion of these children, and tendencies to frank manifestations of instability, in the form of convulsions and seizures both of the "grand mal" and "petit mal" types, are reported in many of their histories.

Macnamara[43] (Australia) as well as several American writers has emphasized that the prospects for training are poor when there is a history of convulsions. In America, McIntire[44] reported convulsive disorders in approximately 20 per cent. of cerebral palsied children of subnormal mentality and in about 10 per cent. of those who might be considered to come within the broad ranges of mental normality.

On looking through our own data, in 796 cases in which specific inquiry was made concerning any history of convulsive disorder, whether observed on isolated occasions only or at repeated intervals, we find that convulsions or seizures are mentioned in the histories of 14 per cent. of the whole group. The least proportional incidence (7 per cent.) was found among those with paraplegia, relatively little variation being found between the incidence in the other spastic types (quadriplegia and hemiplegia) and those in the athetoid and ataxic groups.

The following table presents the percentage incidence of histories of seizures found among 796 cases in the five handicap categories.

TABLE XXXIX

Percentage Incidence of Seizures among Cerebral Palsied Children
(796 *Cases*)

C.P. Types	Athetoid	Ataxic	Quadriplegic	Hemiplegic	Paraplegic	All Types
Percentage incidence	18	19	17	16	7	14

It must be remembered that this sample of 796 cases represents for the most part handicapped children who, by reason either of severe or extensive physical defect, or of poor mentality concomitant with physical symptoms of cerebral palsy, were not making much progress if already attending a school, or else were receiving no education. It should.

however, also be remembered that it is precisely such children on whose behalf, in the past few years, there has been considerable agitation for the provision of special educational facilities, and with special reference to whom this research has been undertaken.

Where the physical symptoms of cerebral palsy are relatively slight and where there is evidence of reasonably adequate intelligence and stability, the question of providing a special educational system exclusively for children so handicapped need not arise, particularly as opportunities for physical treatment at hospitals and clinics are gradually extended. Such children are more likely than not to be better suited by the provision offered at schools of a type catering for children with varied physical handicaps of not too gross a kind. These children, on leaving school, are likely to find suitable employment which will enable them to be partially, if not wholly, independent.

Our problem is not with these children, but is rather to consider to what extent and in what form it seems desirable to make further provision for those whose handicap is so much more extensive or of so much greater a degree that they are unable to attend schools for physically handicapped children or to profit to any great extent from the education and training offered therein.

Where a residential school provides intensive physical treatment as well as education, a certain number of cerebral palsied children from areas in which there is inadequate special school provision for physically handicapped children are likely to be admitted, more for the opportunities offered for intensive physical treatment than for any special educational advantages. If, therefore, it is understood that practically all the children whom we are considering here are those with at any rate physical conditions which prevent attendance at other types of schools, it will be obvious that, as far as these children are concerned, the matter of essential stability is highly important. From data presented in previous chapters, it will also be evident that the handicaps which most of these children suffer are multiple rather than single. If, in spite of such handicaps, these children are to make reasonably satisfactory educational progress, due regard being given to their physical and mental limitations, they need to exert a degree of purpose and determination impossible to children who are not well adjusted or who are fundamentally unstable.

If we now refer to our data again, and this time consider only those children with a history of seizures and from the point of view of general intellectual ability, we find, as might perhaps be expected, that those with a history of seizures fall largely into the subnormal ranges, 72 per cent occur in the ranks of those with IQ under 70 and a further 15 per cent. are found among the very dull (IQ 70–84).

The following table shows a percentage distribution, according to intelligence, of 114 cerebral palsied children having a history of seizures and convulsions.

TABLE XL

Incidence of Seizures among Cerebral Palsied Children (114 *Cases*) *Distributed according to IQ Range*

	IQ Ranges						
	Under 70	70–84	85–99	100–114	115–129	130 and over	All
Percentage incidence ..	72	15	8	2	2	1	100

The markedly heavy incidence of seizures among those falling into the lowest IQ range is in part due to the fact that there was a larger actual (though not proportional) incidence of seizures among the quadriplegia cases and that three-quarters of this incidence fell in the lowest IQ range. The educational prospects of, at any rate, the great majority of these latter children could only be considered very poor, none of them proving suitable even for a special school exclusively for cerebral palsied children.

Among those in the dull, average and even better than average ranges, the considerable variability in concentration from day to day among these children adds to the difficulties already apparent in consolidating even such little progress as they may, from time to time, be able to make. Reports on their progress, or lack of it, all too frequently make discouraging reading. In studying progress reports for child after child with what would seem a reasonably adequate degree of intelligence and often not too gross a physical handicap, such comments as the following were found : " No sign of improvement in 7 months " ; " No progress, poor co-operation " ; " too unstable to co-operate " ; " in 18 months has made little effort and shows scarcely any improvement " ; " slight progress physically if urged but makes no independent effort either in treatment or school " ; " only slow and imperceptible progress in school limited by poor concentration and need for constant supervision " ; " shows no will to improve : concentration and attention poor ; little or no progress made during past year." Comments such as those above were not by any means confined to children in whom symptoms of instability were apparent in the form of obvious physical disturbance, or in whom actual fits had supervened. The comments cited were abstracted from reports on children attending a school at which the general policy was not to accept pupils with histories which gave evidence of marked instability. Conduct and personality disturbances, of a character familiar in many children who produce " epileptic equivalents " rather than distinct seizures, are unfortunately found in considerable number among not only those children of poorer mentality, but also among those whose educational prospects might superficially appear to be relatively good. Personality and emotional instability must of course be distinguished from the emotional and social immaturity generally prevalent among these handicapped children, though it must be admitted that sometimes the distinction is not easy to make. Almost without exception cerebral palsied children, no matter what their potential intellectual ability, tend to be socially and emotionally immature for their physical age, by reason, as much as anything, of the restrictions imposed by their symptoms. Until this fact is recognized they may well exhibit a degree of maladjustment unless the demands made on them are suitably modified.

When we speak of instability, however, we are excluding as far as possible such types of reactive maladjustment as are amenable to reasonable handling based on as full as possible an appreciation of these children's difficulties. In using the term instability therefore we mean a more fundamental inability to adjust, even when every help is given. We mean an apparent inability to sustain a purpose, or to effect an adaptation in accordance with what might reasonably be expected in the light of the physical and mental capacities possessed by a child and any restrictions imposed by his disability. In studying the records of 66 children, some of whom had been discharged from a special school exclusively for cerebral palsied children and some of whom were still in attendance, we find that, in spite of adequate intelligence and not too gross a physical handicap, such general instability, without specific physical crisis, appears to have been a major factor in many cases in which there was unsatisfactory response to education and treatment over a period calculated to give a reasonably good opportunity for adjustment to be made. It is, however, to be noted that, since the school was intended to be experimental, the facilities for education and treatment there were for a time extended to a number of children of subnormal mentality. This was done with the express purpose of arriving at an estimate of the minimum mental and physical capacity necessary for children to show satisfactory response, or at any rate some improvement or signs of progress. Over this period, the incidence of children showing instability was notably greater, and of 16 children with IQ below 70, who during this time were admitted for periods lasting on an average 2 terms, only 2 could be considered reasonably stable apart from their inevitable intellectual and social immaturity. The other 14 children appeared to be prevented from making progress in any aspect of their education or treatment as much by reason of their instability as by that of their innate intellectual limitations.

Of the other 50 children (i.e., those with IQ above 70) instability in varying degree was noted in 19 cases, or approximately 38 per cent. of a group which could be broadly considered as " intellectually normal." As may be seen from Table XLI the respective incidence of instability among the dull and average or better groups of these children showed a much closer approximation with each other than with that found among the subnormal group. The percentage incidence for the group of 66, as a whole, is of course at least 10 times heavier than that found among children in the general population, the approximate incidence for whom is usually estimated as not above 5 per cent.

TABLE XLI

Proportional Incidence of Instability within each Mental Capacity Range (66 Cerebral Palsied Children at a Special School)

	Intellectual Capacity			
	Subnormal	Dull and Low Average	Average and Better	All Ranges
Percentage incidence of instability ..	87	41	33	50

The actual number of children in each of the handicap categories varied from 6 to 21, the largest number being athetoid. Percentage incidence of instability shown by children in the different categories is shown in Table XLII.

TABLE XLII

Proportional Incidence of Instability within each Cerebral Palsy Category (66 Children at a Cerebral Palsy Special School)

	C.P. Categories					
	Athetoid	Ataxic	Quadriplegic	Hemiplegic	Paraplegic	All
Percentage incidence of instability ..	38	50	75	25	37	50

A danger of aggravating rather than moderating instability, or latent instability, in these children is greater on the whole among the comparative few who have better than average intellectual capacity, for it is among these, if any, that any anxiety concerning their own limitations is usually met. This anxiety is often aggravated by the optimism engendered in parents, teachers and others by the promise which they consider these children to show. Such optimism often leads to the making of demands which cannot be met and to the development of over-ambitious expectations, on the part of both adult and child, which certainly in many cases and probably in most are unlikely to be achieved. That they have a tendency to expect undue praise for relatively little effort is a criticism frequently made by those who work with these children. Such comment comes not only from those who, while always ready to offer encouragement and to commend real effort, still manage to retain a sense of reality and proportion when required to make an unbiased and objective assessment of what has been actually achieved, but also from others whose judgment is less critical.

Some over-valuation of achievements may do apparently little harm to the child himself during his earlier school life, particularly when his achievements are hardly won, and it is right that a child should be given due praise for good effort, however inadequate his actual achievements may be. When, however, this earlier period is past and particularly when a child approaches the time when he must leave school and the question of the possibility of eventual employment or further training must be faced, he must learn to accept a normally critical assessment of his efforts. If on the part of teacher or parent, there is continued failure to recognize or admit that work which may have been commendable in very special and sheltered circumstances would not approximate even to what would normally be expected as an average standard, such blindness to reality can only result in distress for the child. If he is to leave a sheltered environment and take his place in the world, albeit still a handicapped person, he must eventually face the fact of his inability to meet normal competition. For this reason, although instability appears to be no more, but if anything rather less, prevalent among cerebral palsied children of normal mental ability than among those who are duller, it is among the former children that are frequently found the major problems of adjustment. Some of the more intelligent among the more severely handicapped children are physically too inco-ordinated to meet the demands of the ordinary routines at a school for physically handicapped pupils and, if required to do so, are apt to become very conscious of their inability to compete even with children having other handicaps. On the other hand, when too long in the company exclusively of other similarly handicapped children, they are apt to be shielded from any experience of failure. In these circumstances they all too often fail to develop powers of self-criticism and tend too readily to remain content with achievements well below standards which, without any undue strain, they might reach. An example, which illustrates this point, may be cited here. One of the few intellectually superior children who, for over two years was in the company of children almost without exception his intellectual inferiors and in many cases physically less well co-ordinated, was content to rub along, making only such little effort from time to time as would keep him abreast of the average achievement of his group. Family arrangements involved his transfer to a school nearer his home. For a short while, pending his admittance at another special school, there was no alternative but to suffer a break in his education or to attend a local primary school. It was then that a realization of his educational retardation came as a healthy shock to him with the result that, within six months during which he applied to his work the effort and determination which he had previously only applied to matters affecting his recreational interests and personal pleasures, he made more progress than at any other time during the previous five years. This achievement incidentally not only had no ill-effects on his general physical condition and social adjustment, but definitely the reverse. It was only unfortunate that, when the awaited opportunity for resuming the interrupted physical treatment arrived, he should again have found himself in a position where too easily he could be " cock of the walk," for when the incentive to continued effort was removed, he reverted to his previous attitude of being content with minimal progress. This case, it must be admitted, was exceptional in so far as few cerebral palsied children with a similar degree of motor inco-ordination have either the intellectual potential, or the capacity for sustained application, which this boy could exhibit when it suited his purpose. Nevertheless, this example serves to raise the question of the desirability of retaining for too long among children who are unlikely to achieve much educationally those of good intellectual capacity who have motor disabilities which, though relatively severe, are not of such a degree as to make impossible any participation in a more normal type of education.

CHAPTER IX

SCHOLASTIC ATTAINMENTS IN RELATION TO DISABILITY. (IRREGULARITIES IN EDUCATIONAL ACHIEVEMENT)

SUMMARY

(1) The achievement levels in basic educational skills attained by 35 cerebral palsied children at a special school were compared with their levels of maturation in each of six special abilities important in learning. (2) Two abilities, appreciation of gestalt and verbal reasoning, were found to be those most closely associated with educational progress. (3) Gestalt maturation bore the closest relationship to arithmetic, and verbal reasoning to reading progress, among the group as a whole. (4) A relatively weaker ability for gestalt appreciation among athetoid children than among spastics was reflected in a relatively poorer achievement in arithmetic. This disability was partly counterbalanced by a generally better ability in verbal reasoning among athetoids. (5) Examples given of irregular development of various abilities important in learning and of the wide range of educational retardation found among even a relatively small group of these children indicate that present-day methods of teaching, which have tended to become increasingly "visual," may need to be modified to suit their needs.

SCHOLASTIC ATTAINMENTS IN RELATION TO DISABILITY. (Irregularities in Educational Achievement)

To what extent, we may now ask, is there, even within the limits of the generally poorer than average capacities of these children, evidence of markedly irregular development of verbal and non-verbal abilities? Do any abilities appear to be particularly closely linked with their educational progress, especially at the beginning stages of learning?

We can revert to that group of 35 children who were particularly studied for gestalt maturation and see how far their achievements in reading accuracy and arithmetic were below, parallel with or above their levels of development in six different factors. These particular factors all have a bearing on progress in acquiring basic educational skills. We find that the degrees of relationship are as set out in Table XLIII. In this table we are not concerned with the actual individual levels of achievement, but only, among the group as a whole, with the relationship between educational achievement and the developmental levels reached in the six chosen factors.

TABLE XLIII

Comparison of Basic Education Skilis with Six Special Factors

	Relationship with Basic Subjects* (percentage)	Percentage Incidence of Relationship					
		1 Gestalt Maturation	2 Verbal Reasoning	3 Visual Memory	4 Visual Reasoning	5 Verbal Memory	6 Vocabulary
Reading	<	26	37	49	49	55	71
	=	49	57	43	40	31	29
	>	25	6	8	11	14	0
	Total	100	100	100	100	100	100
Arithmetic	<	23	43	49	57	63	89
	=	60	46	46	37	28	11
	>	17	11	5	6	9	0
	Total	100	100	100	100	100	100

* <=less than; ==equal to; >=greater than.

From this table it may be seen that extent of vocabulary in itself bears the least relationship to level of achievement in reading and also to arithmetic attainment. At the other end of the scale, approaching that is to say a closer relationship, we have gestalt maturation and verbal reasoning; the former somewhat more closely tied apparently with arithmetic and the latter with reading. Visual memory and visual reasoning rank next in closeness of relationship with educational progress at the elementary stages; while sheer verbal memory, contrary to much popular supposition, is only slightly more closely associated than range of vocabulary in the relation it bears to basic attainment level.

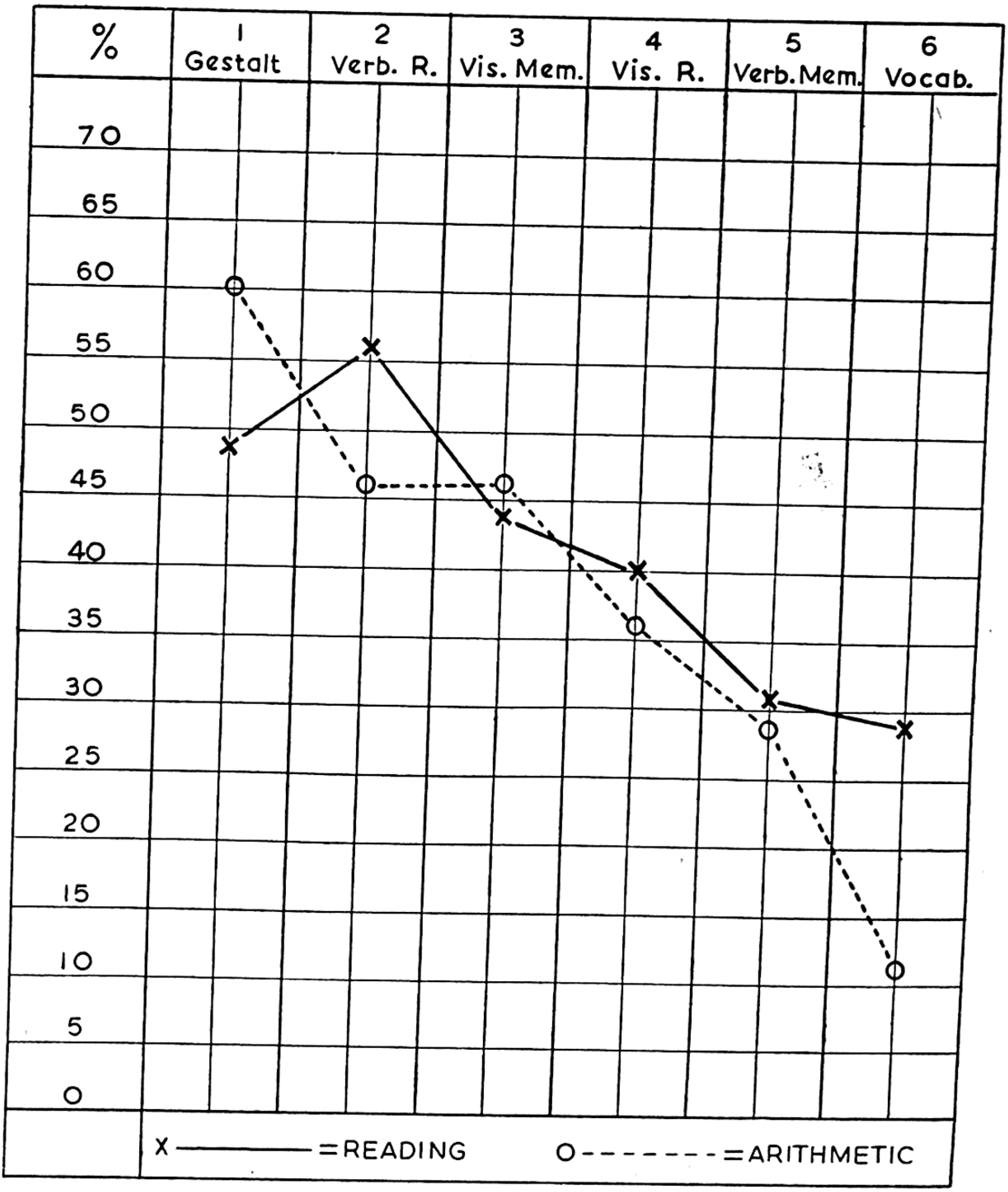
It should be understood that these diminishing degrees of relationship are shown here only with respect to the acquiring of the basic educational skills; they are not necessarily to be interpreted as indicating that the particular six factors chosen for investigation carry the same proportional weights in constituting level of general intelligence. The distributions in the above table seem, however, to throw some light on the question why some of these children who, in general, appear to show better intellectual capacity than others, make very disappointing progress educationally. We refer here in particular to those who experience difficulty especially during the years in which they are attempting to acquire a "useful" degree of skill in the tool subjects of education such as is normally acquired by the average unhandicapped child during his first two years at school.

If we select from Table XLIII the percentages of children whose levels of educational achievement parallel their developmental levels in the six selected factors, we find that the relative importance of ability in each of these factors, as indicative of progress in the basic skills, is clearly differentiated.

For greater ease in making the comparison the relevant proportions are shown graphically for reading and arithmetic separately (Graph 7).

From Graph 7 it may be seen that the diminishing degrees of relationship between educational achievement and the successive factors 1 to 6 are very similar for the two basic subjects. The tendency for gestalt maturation to show a slightly closer relationship with arithmetic than

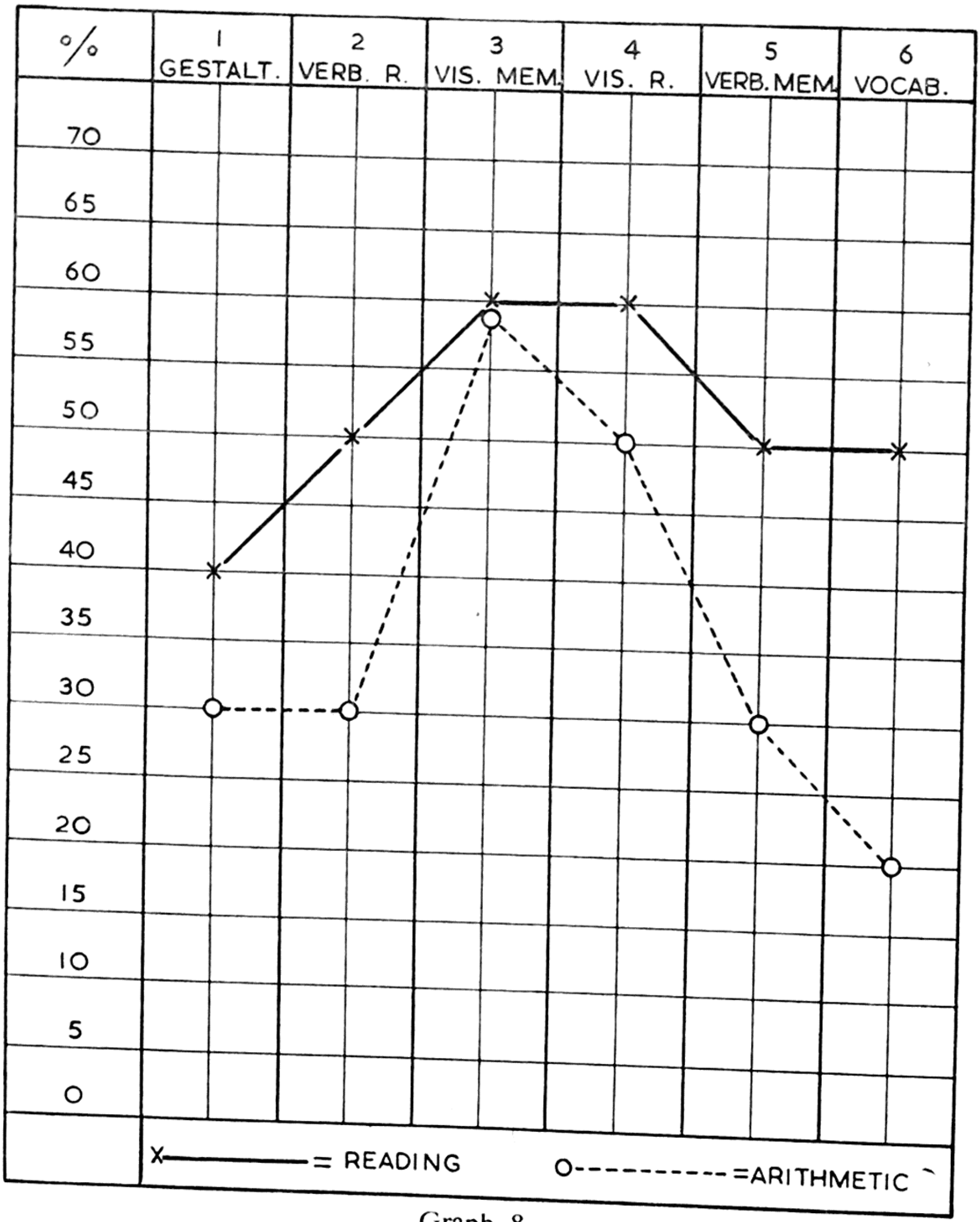
Percentage Incidence: Reading and Arithmetic Achievement Equalling Ability in Six Factors



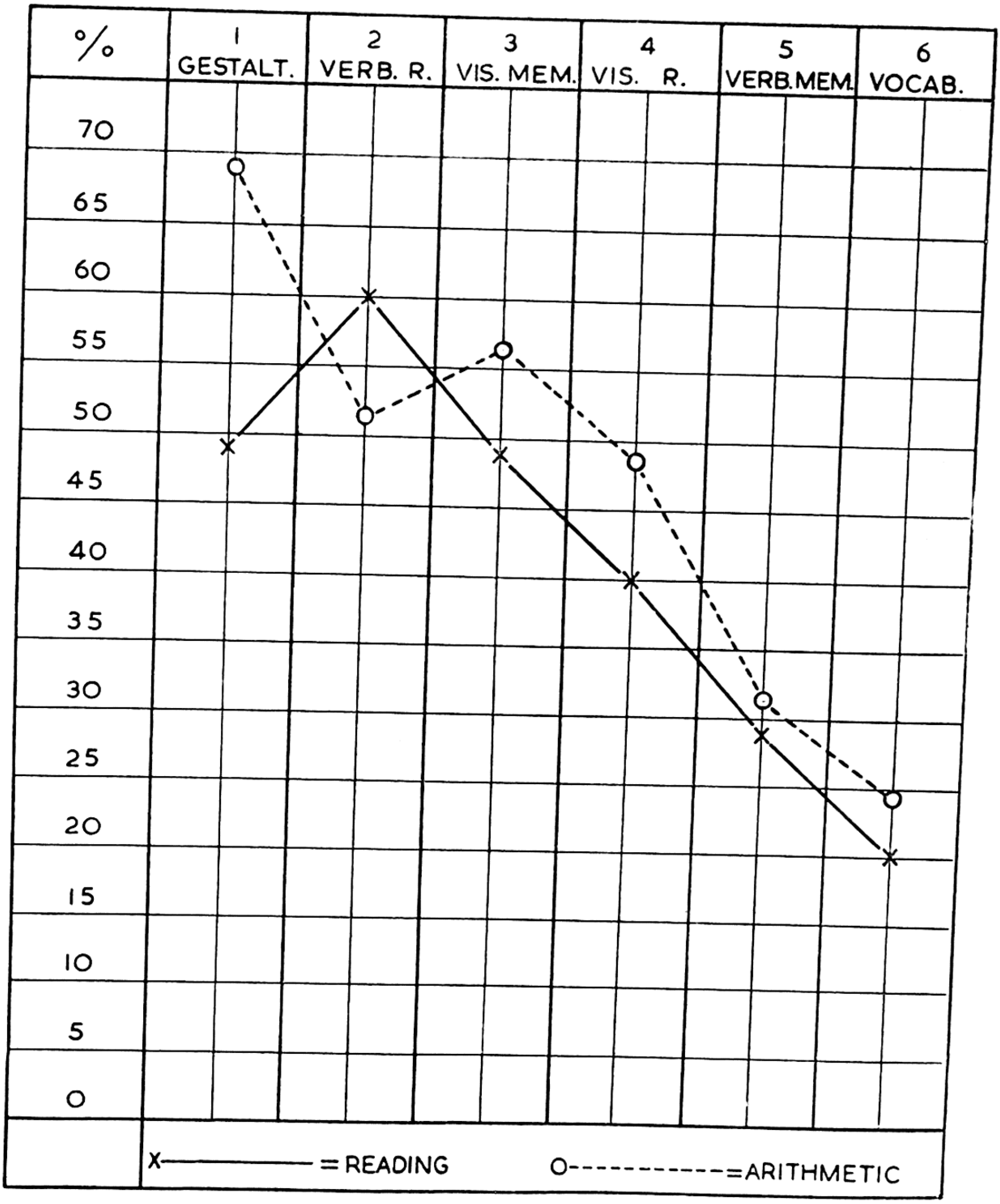
Graph 7.

with reading might be expected. An apparently closer relationship between reading and both verbal reasoning and vocabulary than between these two factors and arithmetic is also not surprising. Even despite these slight variations, however, the general trend of closeness of relationship between ability in each of the selected factors and achievement in reading and arithmetic respectively is remarkably similar for the undifferentiated group of 35 children as a whole. If we now extract from this total group those children who were athetoid and those who were spastic, we find certain differences in the degree to which level of educational achievement and ability in each of the selected factors are found parallel with each other in the two respective groups.

These differences are shown in Graphs 8 and 9.



Graph 8.



Graph 9.

The degree in which ability in factors 3 to 6 inclusive is found to equal attainment in reading appears to be greater among athetoid children than among spastics. As regards achievement in arithmetic, however, there is, for both groups, the same very limited degree of coincidence with factors 5 and 6, but with factors 3 and 4 a considerably closer relationship is found both among athetoids and spastics.

For factors 1 and 2 (gestalt maturation and verbal reasoning) the position is somewhat different for the two types of handicap. While reading achievement runs parallel with ability in both these factors only a little more closely among spastics than among athetoids, we find a wide divergence between the relationships apparently existing for athetoids and spastics respectively between ability in these two factors and achievement in arithmetic. The widest difference appears between the degree to which achievement in arithmetic approximates to ability for gestalt appreciation (factor 1) among children in each of the two respective groups. Among the athetoids there is little association, but among the spastics the relationship is very close.

Can we assume from this that athetoids, with their generally poorer gestalt appreciation, have on the whole a greater tendency to poor arithmetic ability, or do they tend to make use of other factors in learning so that their poorer ability in factors 1 and 2 is counterbalanced by better ability in other respects?

In considering these questions, we can take an attainment age of 7 as that at which the basic tool subjects begin to be " useful " and can compare the percentage of attainment below and above that level in both subjects for the two groups. It should perhaps be mentioned that this rather broad grouping is adopted since, although these children were highly selected as representing those few, out of very large numbers, who were considered most likely to profit from the facilities offered for special education, the level of attainment among them was without exception very low, so that to differentiate levels much above seven years would be purposeless.

If, therefore, we show, against percentage incidence of attainment above and below the seven year level for each type, the proportions of children in the two cerebral palsied categories whose mental and actual ages were above and below this level we shall get a rough indication of any marked differences in extent of retardation in the two groups. This is shown in the following table.

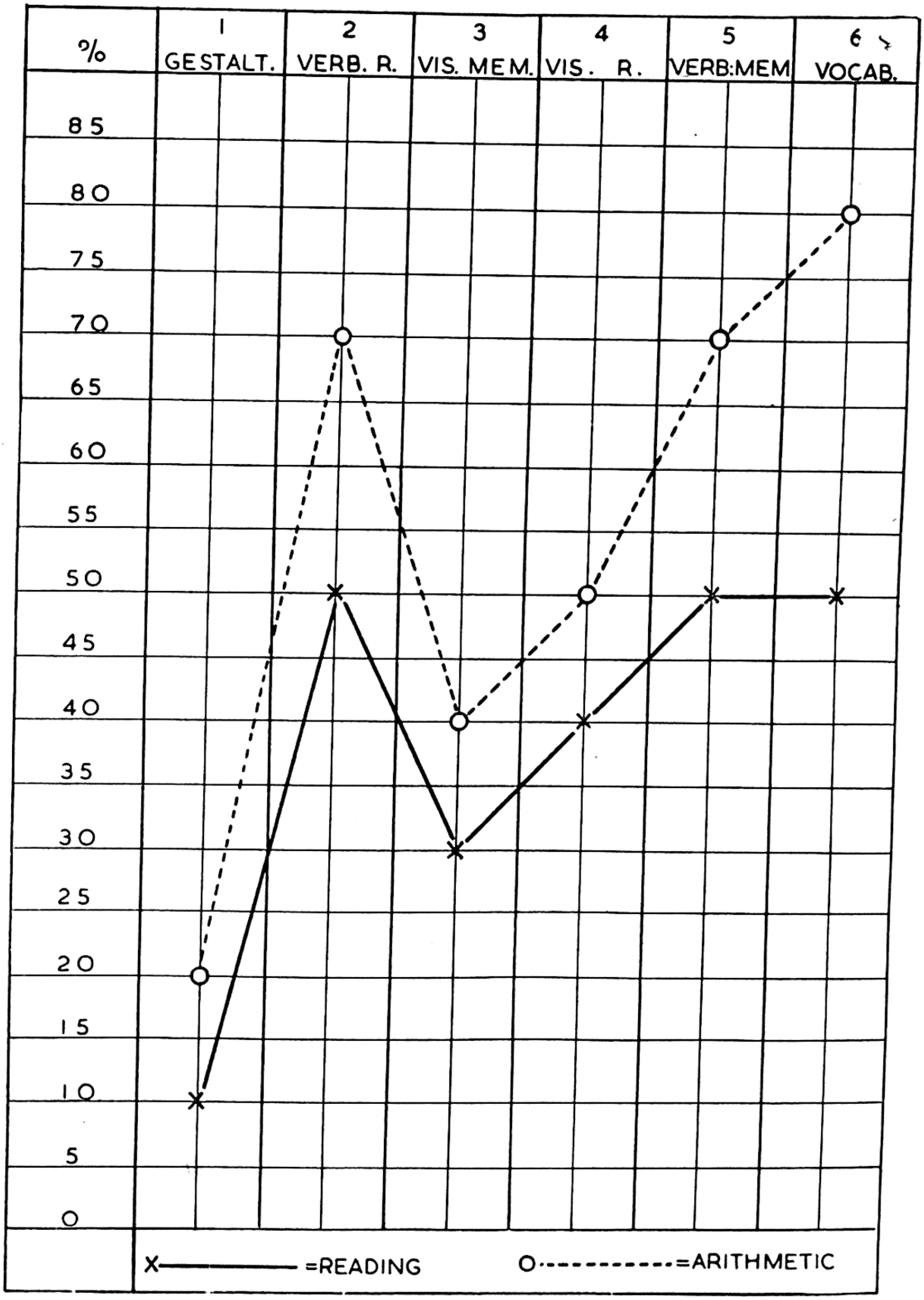
Table XLIV

Achievement Groups in Basic Subjects

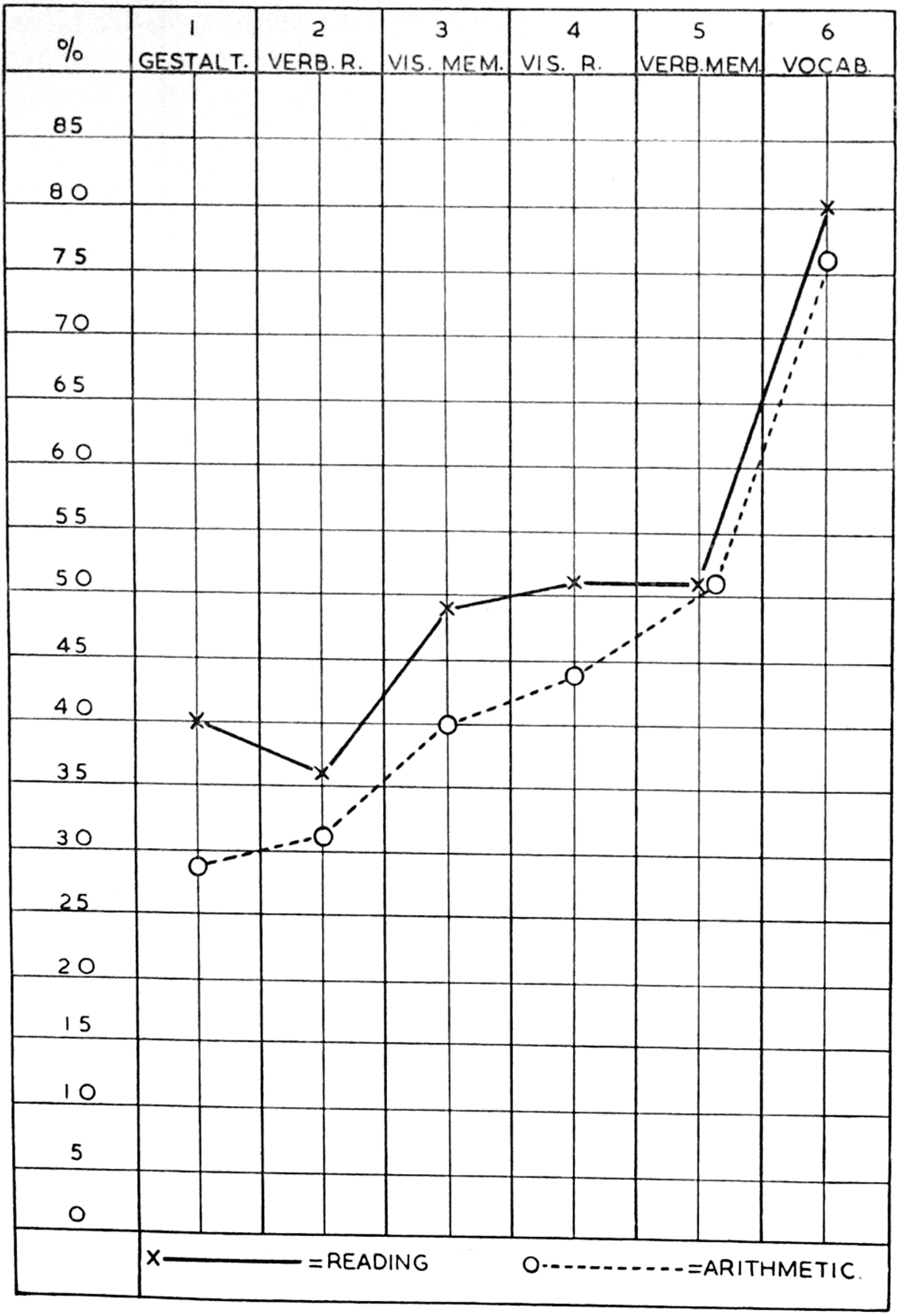
C.P. Type	Percentage Incidence Under 7 Years				Percentage Incidence 7 Years and Above			
	Reading	Arithmetic	M.A.	C.A.	Reading	Arithmetic	M.A.	C.A.
Athetoid	70	70	10	10	30	30	90	90
Spastic ..	76	72	36	12	24	28	64	88

This table indicates that although, in both of the basic subjects, there is little to choose between the percentage incidence of achievement found respectively above and below a seven year level for the two categories of handicap, there is in fact a relatively greater incidence of retardation among the athetoid group in as much as a greater proportion of the children in this category had mental capacities above a seven-year level than was the case among the spastics.

Although it would appear then that weakness in certain factors, particularly in gestalt appreciation among the athetoids, is not completely counterbalanced by greater ability in other factors important to the acquiring of basic educational skills, we need to inquire whether a slightly better ability in certain factors may not perhaps partially compensate for other disabilities.



Graph 10.



Graph 11.

We can perhaps get some idea how far this operates by plotting the extent to which ability in the six selected factors was greater than attainment in reading and arithmetic. This is done separately for the athetoid and spastic groups in Graphs 10 and 11.

From Graphs 10 and 11 it is clear that, in the great majority both of athetoid and spastic children, vocabulary range is well above attainment in both basic subjects; however, as we have already seen, this in itself appears to have little bearing on actual attainment or on learning capacity. As regards one other factor, however, viz., verbal reasoning, athetoids show a marked tendency to better ability in this than in either reading or arithmetic (see Graph 8). In 30 per cent. of these children verbal reasoning ability approximated to level of achievement in arithmetic and in 70 per cent. exceeded it; in 50 per cent. of cases approximated to reading achievement and in 50 per cent. exceeded it. In no case was the verbal reasoning ability level below the educational level. It would seen probable therefore that, among these children, relatively better ability in this factor partially compensates for greater weakness in other factors on which educational progress tends to depend.

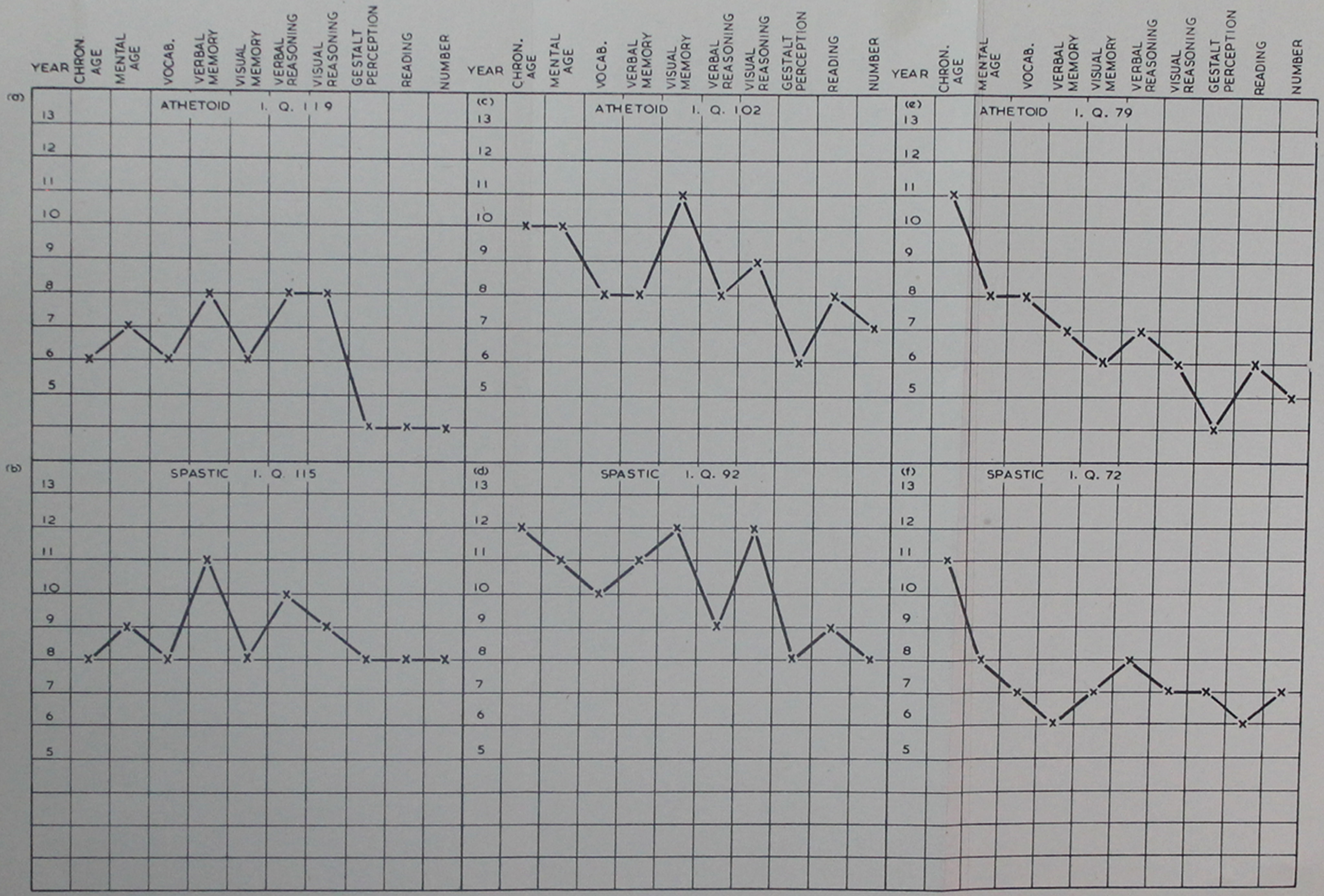
As far as any single factor can be considered predictive, it would seem that, among spastics generally, gestalt maturation level most nearly approximates to level of arithmetic attainment and verbal reasoning ability to their reading level. Among athetoids accuracy of visual memory would appear to be the most likely of the six factors to approximate most nearly to level of educational attainment in both subjects, possibly because these children tend to verbalize about material presented visually.

It may be of interest to show some individual examples of uneven development of abilities found generally among these children. Instances are therefore given in Graphs 12 (*a*) to (*f*) of one each of relatively bright (*a* and *b*), average (*c* and *d*) and relatively dull (*e* and *f*) athetoid and spastic children.

With children showing such uneven development in the various abilities on which learning depends, it seems clear that, if satisfactory progress in education is to be expected, other methods of teaching than those generally agreed nowadays as best for the majority of ordinary children should at least be explored. Even methods which, in accordance with present day educational principles, tend to be rejected may be found to offer a more suitable medium for children so much less well equipped with the abilities which the more modern methods tend to utilize.

Opportunities for experiment with various methods of teaching were unfortunately very restricted during the period of investigation at the special school for cerebral palsied children from which the group discussed above were drawn. Rapid turnover of children for various reasons, frequent staff changes, necessary changes in routines due to general re-organization, and interruptions due to illness among children or staff, all militated against the carrying out of planned experiments during the two to two and a half years during which the data for this study were being collected.

Few children were admitted with any considerable basic educational achievement, although about 40 per cent. of admissions, during the period referred to, had already been receiving some form of education



GRAPH 12 (a) to (f)

at ordinary primary or private schools, at schools for physically handicapped children, or by home teaching, for periods varying from a few months to several years. Any accurate assessment of rates of comparative progress with different methods among these children is therefore not possible.

It can be said however that, without a single exception, whatever the opportunities for previous education, age of admission to the special school, level of general intelligence or degree of handicap, all

TABLE XLV

Chron. Age Years	No. of Children With Previous Schooling	Periods at Special C.P. School (years)	No. of Children	Retardation (in Group)			
				Reading		Number	
				Max. years	Min. years	Max. years	Min. years
5+	1	½	2	1	1	1	1
6+	1	1	4	2	2	2	1
	—	2	1	2	2	½	½
7+	2	1	4	3	2	3	2
	—	1½	2	3	½	2	1½
	—	2	2	3	1½	1½	1½
8+	2	1	2	3	1½	2½	1½
	—	1½	1	2½	2½	2½	2½
	—	2	1	4	4	4	4
9+	—	1	2	4	3½	5	3½
10+	2	½	2	3½	0	3	1½
	2	1½	3	6	0	6	2½
	—	2	3	6	2½	4½	2½
11+	1	½	1	3½	3½	4½	4½
	—	2½	1	4	4	4	4
12+	1	1	1	3	3	4	4
	2	1½	2	3	0	4	3
	—	2	:	8	0	8	3
13+	1	1	1	1	1	5	5
14+	—	2½	2	10	7	9	7
15+	1	2	1	3	3	5	5
5+ to 15+	16	½ to 2½	40	1 to 8	½ to 7	½ to 9	½ to 7

the children admitted were educationally retarded in either one or both of the basic subjects, but usually in both.

In view of the different backgrounds of these children the most that can be done at the moment is to show, among the various age groups, the extent of the maximum and minimum degrees of retardation in reading and number which were found after these children had spent varying periods at the special school for cerebral palsied children. It must be remembered that, particularly among the older children, there were histories of attendance for varying periods at previous schools and that the often serious degree of educational retardation found among them cannot be imputed to a failure, on the part of their present school, to cope with the difficulties with which these children were often admitted. Again, some of the older children had, before admission, received little regular teaching and in no case had any child been at the special school for longer than two and a half years. In fact, of the 40 children to whom Table XLV refers, it will be seen that 5 children had been in the school less than one year; 22 for between one and two years, and 13 only for two or more years.

Some idea of the difficulties facing a teacher of a class of such children may be gathered from the range of ages and degrees of retardation shown among the 40 children on whom information is given. Not all of these particular children of course were at one and the same time in any one class group, for school work was carried on in two separate classes for which the grouping was as far as possible by age. The whole school group for most of the time amounted to between 30–36 children among whom the varying degrees of retardation found from time to time were those referred to in the table. Whether conformation to the prevailing fashion of grouping children for teaching by chronological age, rather than by attainment age and education difficulties, is a good thing is a highly debatable point in any discussion; it is even more questionable when children so handicapped are being considered. On this matter alone, there remains much that still needs proof by practical demonstration rather than by theory. In any case, age group teaching can in fact be given only in name where such children are concerned. Not only is this method of teaching in practice largely impossible on account of the wide differences between individual attainment levels, but, further, among these children, additional complications are introduced by the varying types and degrees of the handicaps under which they are labouring. In a significant proportion of cases, further sensory or other defects or difficulties also add to the teacher's task and hinder progress among the children themselves.

CHAPTER X

EDUCATIONAL PROGRESS

SUMMARY

(1) The extent of educational progress achieved by 37 children is considered in relation to time spent at a special cerebral palsied school. (2) On the whole, the better the potential intelligence the better the rate of progress both in reading and arithmetic. Where progress was poor despite fair intelligence, the children were usually young or unstable. (3) Despite a higher incidence of dullness among children over 10 years of age, proportionately fewer of them than of the younger children made very poor educational progress. (4) Children who had previous experience of school appeared later to make better progress at the special school. (5) In order to make a rate of progress equivalent to that of an unhandicapped child, a cerebral palsied child needs a relatively better intelligence. (6) In organizing special education for cerebral palsied children, three points in particular need consideration—viz., minimum desirable intelligence, minimum age, and the extent to which physical treatment should be given concurrently with formal education.

EDUCATIONAL PROGRESS

Although in the last chapter (Irregular Development) some reference was made to the range of retardation found among a group of children, the matter of actual progress, in relation to time spent at school and other factors, was not discussed.

Among the relatively small group of 37 children on whom we were able to make successive checks of educational progress, there was a wide age range and a history of varying periods spent by some of these children previously in other schools. It seems best therefore to ignore for the moment any actual individual attainments, with which these children entered the special school, and to consider first any increases in achievement shown by them in relation to the time they had spent at a dual purpose school exclusively for cerebral palsied children.

Table XLVI distributes (in half-yearly periods) school attendance and educational progress in the basic subjects.

Table XLVI

Period at C.P. School (years)	Extent of Progress (in ½ year intervals)					
	Less than ½	½–1	1–1½	1½–2	2–2½	Total
Less than ½ ..	—	—	—	—	—	—
½–1	3	1	—	—	—	4
1–1½	10	2	1	—	—	13
1½–2	4	1	—	—	—	5
2–2½	6	4	4	1	—	15
Total	23	8	5	1	0	37

From Table XLVI it may be seen that, of the 23 children who had made less than a half-year progress, 10 had been at the school for between one and a half and two and a half years, and, of the total who had been at the school for that time, only 6 had covered at least an average year's work. When we speak of " an average year's work " we do not mean the amount of ground which in that time would normally be covered by an unhandicapped child of average intelligence and of comparable age, for all the children were seriously retarded educationally and none had achieved anything like the level of attainments normally reached by ordinary children of similar age. To explain what we intend by the term " an average year's work," we can take as an example a child of 9 years who enters the school with an achievement level approximate to that of an average 5-year-old. If, by the end of the ensuing 12 months (i.e., by the time he is aged 10 years) he has achieved an educational level equivalent to that of an average 6-year-old, we have credited one year's progress, although in fact an average normal child between 9 and 10 years would almost certainly, given consistent teaching, be capable of covering more ground than would be covered in that time by an average child between the ages of 5 and 6.

The very limited progress of these children in school is not entirely accounted for by the incidence of intellectual dullness found in addition to the physical disabilities among this particular group. As shown in Table XLVII, although 12 out of the 37 had IQs less than 85, 14 were ranked as " low normal " (IQ 85–99), 6 as " average to good average " (IQ 100–114), and 5 were of better ability.

The following table assesses progress proportional to the period spent at the school and sets this against IQ range ; i.e., a child who had been receiving education at the school for a period of one year and who in that time had covered between three and six months " average work " would be ranked in the 25–50 per cent. progress column and in the row appropriate to his IQ rating.

TABLE XLVII

Progress and Intelligence

IQ Range	Less than 25 per cent.	25–50 per cent.	50–75 per cent.	75–100 per cent.	Total
Under 85 . .	8	4	—	—	12
85–99	7	3	2	2	14
100–114	—	4	1	1	6
115 and above . .	—	2	2	1	5
All	15	13	5	4	37

It will be seen that relatively poor progress (under 50 per cent.) was not confined by any means entirely to those with the poorest potential ability, although, on the whole, the better the ability the better the progress, as might be expected. The 2 children out of the 5 with IQ 115+ who made less than 50 per cent. progress were young and in one case unstable; the 4 out of 6 with IQ 100–114 who made only 25–50 per cent. advance were all children who were not very stable and who would be unlikely ever to be able to make the maximum use of their potential intellectual ability. From the point of view of type of handicap, of those who made relatively little progress, 3 were paraplegics, 2 were athetoids, and 1 an ataxic. Of the 4 who made the best rate of progress educationally, 2 were right hemiplegics who were fortunately natural sinistrads, and 2 were athetoids. Of the 2 right hemiplegics, 1 was intellectually above average and the other "low normal" but not too handicapped to have previously attended an ordinary primary school; the 2 athetoids had previously had good private teaching, although no physical treatment, and had entered the special school with, all things considered, a fairly adequate groundwork in the basic subjects.

We must consider next the influence of age, for, since we found general progress to be more obvious among older children, there was the possibility that age in itself in some measure accounted for their showing a greater interest in acquiring educational skills. In considering the factor of age in this connection, we have expressed the progress achieved in each of the two basic subjects as a percentage of the time spent at the special school. The resulting distribution for the 37 children is given in Tables XLVIII (*a*) and XLVIII (*b*) for reading and arithmetic respectively.

TABLE XLVIII (*a*)

Reading

Age Group	Percentage Rate of Progress				
	Less than 25	25–50	50–75	75–100	All
Under 10 years ..	9	4	1	2	16
10 years and over	7	5	4	5	21
All	16	9	5	7	37

TABLE XLVIII (*b*)

Arithmetic

Age Group	Percentage Rate of Progress				
	Less than 25	25–50	50–75	75–100	All
Under 10 years ..	8	6	1	1	16
10 years and over	7	7	4	3	21
All	15	13	5	4	37

There is a little difference in the distributions for the two subjects, in so far as 12 out of the 37 children made 50 per cent. or more progress in reading as against nine out of 37 in arithmetic. The general rate of progress for the group as a whole was very slow however, since 25 out of 37 (68 per cent.) and 28 out of 37 (76 per cent.) made less than 50 per cent. progress in reading and arithmetic respectively.

If we now compare the rates of progress shown separately by children under 10 and those of 10 and over, we find the following points of interest :—

1. *Reading.*—Out of 16 children aged from 6 to 9+ years, only 3 (19 per cent.) made a 50 per cent. rate of progress ; among those aged 10 years or more, however, more than double this proportion, 9 out of 21 (44 per cent.) showed this better achievement rate.

2. *Arithmetic.*—Out of the 16 children under 10 years, 2 only (12 per cent.) achieved a 50 per cent. or better rate, while among the 21 children aged 10 or over, 7 (33 per cent.) showed this rate of achievement.

While it is probable that the higher incidence of better progress among the older group is largely attributable to the slightly higher incidence of better than average intelligence among this group, this fact does not also explain why, among those who made little or no progress (i.e., less than 25 per cent.), there should have been a disproportionately heavier incidence among the younger group. 56 per cent. of those under 10 years of age fell into this " less than 25 per cent." category, as against 33 per cent. of those aged 10 and over who had made as little advance. If we consider the incidence of very dull children in these two age groups (Table XLIX), we see that 9 out of 21 (43 per cent.) of those over 10 years fell into the IQ range " under 85," while only 19 per cent. (3 out of 16) of those under the age of 10 were in that range.

TABLE XLIX

Age and Intelligence

Age Group	IQ Range				
	Under 85	85–99	100–114	115 and Over	All
Under 10 years ..	3	10	1	2	16
10 years and over	9	4	5	3	21
All	12	14	6	5	37

It would seem, therefore, that, though the age factor may play little part in any better progress rate of those of higher intelligence among these children, it seems to have some effect among those of less ability.

There is yet another factor which we must consider in relation to progress, viz., previous schooling. We give, therefore, in Tables L (*a*) and (*b*), distributions of percentage progress in reading and arithmetic respectively in the two age groups and according to whether or not there had been any previous school attendance.

Among children aged 10 years and over, 67 per cent. had previously attended schools of other types (ordinary and for physically handicapped children) as against only 19 per cent. of those below the age of 10.

In view of the relatively better rate of progress even among the duller of these older children compared with those in the younger group, it seems possible that, though any response made at previous schools may have been poor, the children concerned had gained something by attendance, despite apparent lack of any progress at the time.

TABLE L (*a*)

Reading

Age Group	Previous School	Progress (percentage)				
		Less than 25	25–50	50–75	75–100	All
Under 10 years ..	Yes	1	0	1	1	3
	No	7	5	0	1	13
10 years and over	Yes	4	5	2	3	14
	No	3	1	1	2	7

TABLE L (*b*)

Arithmetic

Age Group	Previous School	Progress (percentage)				
		Less than 25	25–50	50–75	75–100	All
Under 10 years..	Yes	1	0	1	1	3
	No	7	6	0	0	13
10 years and over	Yes	4	5	3	2	14
	No	3	2	1	1	7

If we compare the relative incidence of a 50 per cent. or better rate of progress in reading and arithmetic among those with and without previous schooling, ignoring age, the influence of the school factor becomes more apparent.

TABLE LI

Progress 50 per cent. or better

Previous School	Reading (per cent.)	Arithmetic (per cent.)
Yes	41	41
No	20	10

We may now ask two questions: first, who are the children who, though of course not having anything like normal attainments for their age, could be credited, in spite of their profound retardation, with making reasonable progress (i.e., 50 per cent. or better) when they attended a school specially for cerebral palsied children ; and, secondly, why should these children, rather than the others, have been able to do this ?

The most obvious factor undoubtedly is intelligence. In order to make any progress, children with multiple handicaps, such as most of these children are labouring under, need rather more innate ability than the minimum required among unhandicapped children to achieve a reasonably satisfactory progress.

On the basis of our evidence we would suggest that at least from 15 per cent. to 20 per cent. better innate intellectual ability than the normal child needs is required by a cerebral palsied child if he is to be able to achieve a roughly approximate rate of educational progress. A dull, but stable, physically normal child of IQ 70 could make a 65–70 per cent. educational progress rate, but in order to progress at this rate a cerebral palsied child needs to have an IQ of 85–90 at least. Even given such an increment in the required minimum of innate ability, an approximately equivalent progress to that shown by a 15–20 per cent. duller " unhandicapped " child is possible to a handicapped child provided only that he does not suffer added disadvantages in the form of personal instability or sensory defects likely to impose further limits on the extent to which his potential capacity can be used.

Secondly, age would seem to be a factor not without significance, for relatively satisfactory progress was noted two or three times as frequently among children aged 10 years and over as among those below the age of 10. This would suggest that, among cerebral palsied children, formal education is unlikely to produce any very satisfactory response if begun much before the age of about 9 years.

Thirdly, the obvious educational advantage which those with a previous experience of a school for physically handicapped children or an ordinary school had over those who had never attended a school in which education rather than " treatment " was of prime importance, raises the question of the form which future general organization for education among cerebral palsied children could most suitably take.

CHAPTER XI

SELECTION OF CHILDREN FOR SPECIAL CEREBRAL PALSY EDUCATIONAL SCHEMES

SUMMARY

(1) The criteria for selecting children for educational schemes designed for those with a cerebral palsy handicap are necessarily complex. Mental ability alone is not a sufficient criterion. Confronted with the multiple difficulties which beset such children, the teacher's primary duty is to consider the positive assets that remain, however slender these may be.

(2) No basis of selection can be established without first considering the meaning of education in relation to these children. To be of value in this field, education must be thought of as concerned with every type of development, social and personal as well as scholastic, and motor as well as mental.

(3) The essential problem of selection in this field concerns the child who because of the degree or extent of his motor handicap requires a special type of provision either within a school for physically handicapped children, or in a centre exclusively for children with cerebral palsy, where facilities for both education and physical therapy exist.

(4) Where this dual approach, educational and physical, is planned, care must be taken that purely medical criteria are not allowed to determine selection or rejection.

(5) Although mental ability cannot be the sole criterion, it is nevertheless a very important and, in some cases, a limiting one. It has been shown that, among children with cerebral palsy, limitation and physical handicap are definitely and positively related, i.e., they are apt to go hand in hand, although this will not happen in every single case.

(6) The evidence for the importance to be attached to intelligence may be summarized as follows :—

(*a*) Cerebral palsied children whose physical disabilities prevent them from attending schools for physically handicapped children are, on the average, of lower intelligence than those cerebral palsied children who attend such schools.

(*b*) Among the quadriplegics, there are fewer children of average or better intelligence than among those with other types of cerebral palsy which involve less extensive physical handicap.

(*c*) If educational progress is defined in a broad way then, among the cerebral palsied children who receive education, the division between those who improve and those who do not corresponds roughly to the division between the normal, but slightly subaverage, group and the mentally dull group.

(7) Available evidence suggests that an IQ of about 85 may be taken as a fairly reliable guide to the minimum level of mental ability required to allow cerebral palsied children to profit from special education. It does not follow, of course, that all children who show this level of ability or better, will necessarily profit from such special education. There should, therefore, be no automatic selection on grounds of adequate intelligence level alone. Much depends on the emotional and physical capacities of the child, particularly its capacity to go on trying.

(8) Even among those of average intelligence, there is evidence, on the part of such children, of a too ready satisfaction with very small progress. This may be an integral factor in the total handicap, and one whose appearance may have to be accepted and allowed for.

(9) There is evidence to suggest a lower degree of resistance to illness, and of lower physical stamina, among children with cerebral palsy than among those who are normal. These children appear to be a prey to minor ailments, and they appear generally to be physically smaller than their normal contemporaries.

(10) Age is, of course, an important factor in selection for special educational schemes. On the whole, younger children are less able to withstand the strain of the dual approach (educational and physical). It might be preferable to ensure early physical treatment, beginning education rather later, and from then on place a diminishing emphasis on physical treatment.

(11) How to bring about the optimal relation between education and physical therapy is a matter requiring close study and clear decisions regarding principles. There is at present quite considerable danger of children being provided with physical therapy centres which will have some educational functions, instead of providing them with, or providing for them in, special schools which would have facilities for physical therapy.

(12) On this question of the dual approach, especially in relation to age, the evidence from experience in other countries is ambiguous and inconclusive.

SELECTION OF CEREBRAL PALSIED CHILDREN FOR SPECIAL EDUCATIONAL SCHEMES

As special educational facilities for cerebral palsied children increase, the problem of the selection of suitable candidates becomes more pressing. What is the minimum ability a child should have to enable it to make a reasonably satisfactory response to the education and training offered at these schools? Selection obviously cannot be made with mental ability as the sole criterion, for it should by now be clear that many other factors must be taken into account in assessing probable response to training. The multiple difficulties alone, which all but very few of these children present, make advisable a very careful weighing of those assets which remain when total disabilities are subtracted. Since the teacher's task is concerned rather with what remains than with what is not available, there must be a full consideration of the extent to which assets can best be utilized in any existing educational schemes. We need also to consider the type and range of education which will best meet the needs of those children who may be unable to profit in any very satisfactory way from what has so far been available, or even from any kind of formal education. Except in such cases as those where mental defect is patent and in itself a sufficient barrier to learning, the question is not at all easy to answer. It becomes even more difficult if by " education " we mean not only what may be termed " school education " but the acquisition and expansion of general interests and an improved degree of social adaptation and independence.

The question of selection arises not so much with reference to those whose physical handicap is not too incapacitating for them to attend the more usual type of school for physically handicapped children, or to those with relatively minor physical symptoms whose handicap has taken the form of mental subnormality not too gross for them to be acceptable at a special school for educationally subnormal children. The problem is rather one which concerns those with a greater degree or extent of motor handicap requiring a more special type of provision. Whether this should be established within existing special schools for children with physical or educational difficulties, or take the form of a school or centre exclusively for cerebral palsied children, where provision both for education and for physical treatment can be given, needs consideration.

Where such a two-fold attack on the problem is planned, it is desirable that matters of medical interest alone should not determine the admission or rejection of a child. If this happens, there is always a temptation for those concerned primarily with the physical aspects of the handicap to urge the admission of children who may present interesting physical problems, but in whom any likelihood of response to education, even in the broadest interpretation of that term, may be very slight or even minimal.

Although there are cases in which mental capacity does not vary in direct ratio with degree of physical impairment, we have presented evidence to indicate that there is a positive relationship between extent of physical inability and intellectual limitation. On the whole, the average mental ability among cerebral palsied children who, because of the extent of their physical symptoms, have been unable to take advantage of the special school education available to physically handicapped children, is lower than that found among those who have been able to avail themselves of such provision. Then too, among cerebral palsied children as a whole, those in the quadriplegic category include fewer of those with average or better intellect than may be found among children in other categories in whom the physical symptoms are less extensive though possibly of equal degree of severity within their limits. If we consider educability broadly, i.e., as a question of general progress (including response to physical treatment) rather than specifically as an ability to reach a " usable " standard in at least the basic school subjects, we find that, in differentiating between children who make no progress and those who can be said to have made slight or even fair improvement, the demarcation falls roughly in line with the division between those who are mentally very dull and those who, though sub-average, can be considered as still within the " normal " range.

The following Tables LII (*a*) and (*b*) refer to the general progress of 57 children attending a special school for cerebral palsied children at which both education and intensive physical treatment were given. The progress referred to in these tables does not mean necessarily educational progress, but rather improvement in social independence

TABLE LII (*a*)

Distribution in Terms of General Progress and Intelligence (57 *Cerebral Palsied Children*)

Actual Incidence

Intelligence (IQ ranges)	No Progress	Slight Progress	Fair Progress	Total	Percentage Incidence
115 and over ..	—	4	1	5	33
110–114	3	11	—	14	
85–99	5	12	1	18	32
84 and below ..	19	—	1	20	35
Total ..	27	27	3	57	100
Percentage incidence	47·4	47·4	5.2	100	

TABLE LII (*b*)

General Progress and Intelligence (*Percentage Incidence*)

Intelligence (IQ ranges)	No Progress (per cent.)	Slight Progress (per cent.)	Fair Progress (per cent.)	Total Percentage
100 and above ..	16	79	5	100
85–99	28	67	5	100
84 and below ..	95	—	5	100

and adjustment. For example, a child may be classed as making " slight progress " when, though he has still no educational attainments, he has begun to feed himself or is requiring less assistance in dressing and undressing or in attending to his personal needs. If such progress, even though very limited in its reference, showed at least that the child was capable of improvement in some degree and in some one respect or other, such improvement has been credited. Whether in fact children whose progress continues to be limited to only slight improvement in social independence would be better suited by some other type of provision than that at a school ostensibly for " educable " children is a matter for discussion.

From Table LII (*a*) it may be seen that the actual incidence of children in the three broad ranges of intelligence, " very dull and subnormal " (IQ 84 and below) " dull and low average " (IQ 85–99) and " average or better " (IQ 100 and above), was very similar. A comparison of relative progress in each of these three groups therefore has even greater significance. The admission to the school, for an experimental period, of children of poorer mentality provided useful data in deciding upon the minimal level of mental ability that would be required in children accepted for training and education.

Table LII (*b*) shows very clearly a marked difference between the extent of general response from children within what may broadly be termed the " normal " range and those falling into the category of " very dull and subnormal." A failure to make any progress in 95 per cent. of the latter category shows that there was ample justification in setting a required minimum level of ability at about IQ 85. Before any child was actually accepted or rejected, other factors likely to increase or minimise probable response had to be considered. Progress in no case could be termed really good, hence the omission of such a category in the Tables above, and " fair progress " occurred only in very few cases. Incidences of 79 per cent. and 67 per cent. showing slight progress among the " average or better " and " low average " groups respectively are a justification for continuing treatment at any rate with the majority of these children. Among those of low average and better intelligence who showed no progress (28 per cent. and 16 per cent.) there were, of course, children in whom extent of physical symptoms, or instability, or lack of will to make effort, made it unlikely that they would ever put to full use the potential mental ability with which they were endowed. Such children often present a greater problem and are the cause of greater disappointment to parents, teachers and others than are children whose mental mediocrity is obvious.

It may be very surprising to both teachers and parents that the minimum level of ability required should be as high as approximately IQ 85, for they are familiar with a much lower minimum qualification for even ordinary schools. Teachers who are used to special schools, whether for educationally subnormal children, or ostensibly for those with physical handicaps, would often consider themselves fortunate if the intellectual capacities of most of their pupils were as high. When we consider, however, the ætiology and nature of cerebral palsy and the fact that we are not dealing here with a single sensory deprivation or limited learning capacity alone, but with, in all but few cases, a multiple handicap with widespread effects of a psychological as well as a physical nature, it is scarcely surprising that the minimum intellectual endowment necessary to combat these effects should be as high as the evidence suggests. On the whole, the better the mental capacity the greater the likelihood that effort will be both made and sustained, because the ultimate purpose of that necessary effort will be better understood. Only very occasionally one finds a child who, in spite of relatively poor intelligence, has the essential stability and determination necessary for more than very slight progress. Such children are almost without exception those whose physical symptoms are not very severe, though lack of appropriate treatment at a sufficiently early stage may have aggravated the initial motor disability. Such children, if capable of the required co-operation, may show fairly rapid initial progress within the limits set by their physical and mental capacities. E. Evans Lord, in her study of 300 children commented on the fact that, although she had found some children who showed sustained purpose and determination, they were all of average or better intelligence and, with rare exceptions, were children who had only a mild degree of physical disability, who walked before they were aged 6 and were able to meet adequately the motor control requirements of ordinary school routines.

Our own evidence tends to corroborate her findings. Comments on the response of the mentally average and better children all too frequently refer to lack of effort, insufficient co-operation, insufficient interest in making improvement and a general attitude of being content to remain at the same stage when once they have acquired a slightly better motor control.

The problem of planning education and training schemes which, while encouraging these children to make the required effort, will not be based on too optimistic a conception of their capabilities in this respect, requires further investigation over a longer period. It may well be that this attitude of insufficient determination, and of a too ready satisfaction with little progress, is an integral factor in the total handicap. If this proves to be so, due allowance must be made for it in planning educational schemes. On the other hand, even if it should be an inevitable factor in the total condition, it may become aggravated by the strain imposed by too concentrated an attack on the many facets of the child's difficulty. In schools providing not only education in the more formal sense, but intensive physical treatment also, where daily concentrated effort is required successively in two or even three therapy departments (physiotherapy, occupational therapy and speech therapy), some children appear not only to have little energy left for work in school, but even at intervals require days of complete rest to recover from the strain of their successive treatments.

It is frequently emphasized that cerebral palsied children are not " sick " children ; observation over the past three years would suggest, however, that they show a lower degree of mental and physical resistance and stamina than do normal children. They appear more likely to have minor ailments and to succumb to any infection to which they may be exposed. Even in their physical framework they seem, with few exceptions, to be under average size for their age, a fact which appears to have received little, if any, comment in the literature, but which may possibly be found to have a close connection with fœtal abnormalities at a biologically primitive stage from which the ensuing handicap often arises.

Mention may be made here of another factor which appears to have some influence on general progress. In spite of a justifiable insistence, by those concerned with the physical treatment of these children, on the need to begin appropriate therapy at an early age and the undoubted benefit to the child when this can be given during the pre-school age years, our data suggest that, among children of school age, progress can be observed more frequently among those of an age to give ready co-operation than among the younger children.

It may be that, in a dual purpose system of education and intensive physical treatment, the younger children are less able to survive the strain of simultaneous efforts in two or three directions, or merely that, by reason of their age, they are less able to appreciate the need for persistent effort, or possibly that both these factors operate. In support of this observation we give the following distributions of grades of progress, differentiating this time between children under 10 years of age and those of 10 or over.

The percentage incidence is first given in respect of younger and older children within each progress grade, and secondly of progress grades within each of the age groups.

TABLE LIII (*a*)

Age and General Progress
Progress Grade

Age Group	No Progress (per cent.)	Slight Progress (per cent.)	Fair Progress (per cent.)
Under 10 years ..	67	41	33
10 years and over ..	33	59	67
All	100	100	100

TABLE LIII (*b*)

Progress Grade

Age Group	No Progress (per cent.)	Slight Progress (per cent.)	Fair Progress (per cent.)	All (per cent.)
Under 10 years ..	60	37	3	100
10 years and over ..	33	59	8	100

The above distributions leave little doubt that age is of importance in selecting children for special schools, particularly when consideration of probable time lag in response to training must be taken into account in allotting vacancies to the most promising candidates. It is possible that, unless treatment is begun well before school age, the advantages otherwise associated with early training may be offset to a considerable extent by other factors which operate when children between the ages of approximately 5 and 9 are introduced simultaneously to treatment and school education.

In other countries, approaches to the problem of training cerebral palsied children have been mainly on the physical side, with school education taking at best a second place. Little opportunity has been afforded for seeing what might be accomplished through special education alone, particularly among children who have received fairly intensive physical treatment during their pre-school years. Although this statement might be challenged in so far as many cerebral palsied children have in this country passed through the schools for physically handicapped children and, in many cases, have derived much benefit from this education, few records have been kept of progress in relation to extent and type of handicaps. In most cases, relatively little information about any special difficulties likely to be experienced by such children has been given to those who have had charge of their training These people would often have been helped and encouraged by a little more knowledge of the difficulties they might expect to encounter. In this country the idea of dual purpose schools (i.e., for education and physical treatment) appears to be spreading fairly rapidly, but as yet there seems to be little factual justification for any great enthusiasm for this type of scheme. The presence of departments of therapy in such schools complicates inevitably both the planning and the actual carrying out of educational schemes. There is a natural tendency in such schools for each department to consider its requirements to have first claim, but there is an even stronger tendency for those concerned with the physical side of the training actually to get priority. The end result unfortunately is for what was intended to be a school offering facilities for physical treatment to become a physical therapy department with opportunities for education, this being made available at such times and in such measure as the treatment programmes will allow. A question inevitably arises therefore as to whether, in practice, it will be possible for educational schemes ever to have the desired and necessary scope for experiment in such conditions, and whether a dual purpose type of school can offer even as good an opportunity for education as does a school for physically handicapped children which does not include therapy departments in its establishment.

CHAPTER XII

PLANNING EDUCATIONAL CARE FOR CEREBRAL PALSIED CHILDREN

SUMMARY

(a) Incidence

(1) Before special educational schemes for cerebral palsied children can be planned we need to know both the total incidence of these children and the proportion likely to need special care.

(2) No published estimates exist concerning the size of the problem in this country. Estimates of incidence in other countries are sometimes quoted, but appear to be inapplicable here.

(3) An incidence of approximately 1 per 1000 (England and Wales) can now be estimated on the basis of data obtained from a large number of local authorities, checked by very detailed investigations carried out in ten representative areas.

(4) This estimate is compared with the roughly estimated incidence of other disabilities requiring special educational treatment.

(b) Future Organization

Two main questions arise in connection with organization,

(i) what type of provision is needed?

(ii) For how many children should accommodation be planned?

(1) For most children not already suitably placed in special schools, social and motor training should take precedence over more formal education. For children up to the age of about 9 years, this training could be given in dual-purpose centres. For children of 10 years and over, transfer to special schools for more formal education is advisable only in the case of those with " normal " mental ability. Approximately IQ 85 is suggested as a minimum acceptable level.

For those unable to profit from such education, continuation at dual-purpose centres might benefit some, though for most the provision of Occupation Centres would probably be best.

(2) For children from 5 to 9 years accommodation at dual-purpose centres would be required for between 800–900, after excluding some 250–300 likely to be suitable only for " custodial " care. For children aged 10 to 16 years suitable for Occupation Centre type of training, 400–450 places would be needed. Accommodation for between 175–260 would be needed for those aged 10 to 16 years with ability to

profit from formal education, though possibly too handicapped to attend ordinary schools or those of the usual type for physically handicapped children.

(*c*) *Parent Guidance*

Parental attitude is an important factor in treatment and education.

Prolonged dependence on the part of the child may be caused both by parental impatience and by over-protection.

Parent guidance can help to inculcate a rational attitude from which both child and parent will benefit.

PLANNING EDUCATIONAL CARE FOR CEREBRAL PALSIED CHILDREN

(*a*) *Incidence*

Whatever may be known about the capacities, incapacities and special needs of individuals and selected groups, little in the way of large scale planning can be done until evidence is produced of the size of the problem as a whole, the extent to which available services already meet requirements and the probable range and type of service required for those whose needs are still not being met.

We need therefore in the first place evidence of the incidence of cerebral palsy handicaps among children in this country.

Much of the recent agitation for additional special educational provision for such children in this country has been prompted partly through a degree of ignorance of what already is available for those who can profit satisfactorily from existing educational schemes and partly because, through lack of estimates based on incidence surveys in this country, there has been a tendency to accept and to quote those available from other countries, which at the best have been based on one or two surveys only and these with a bias towards the medical aspects. It has frequently been forgotten that these countries (viz., U.S.A. and Australia) have Education, Health Service and social and climatic conditions different from those in Britain. Incidence figures based on surveys from those places are therefore not necessarily valid if applied in this country.

The New Jersey survey (1940), so often quoted in articles on the subject of cerebral palsy, gave an incidence of seven births annually per 100,000 total population. Of these, it was said that 1/7th died at an early age leaving approximately 96 cerebral palsied children, aged 16 years and under, in each total population of 100,000 persons. Assuming that the child population within this age range accounts for approximately 1/4–1/5th of the total population, the resulting incidence of children with cerebral palsy would approximate to from 3.8 to 4.8 per 1,000 of the total child population.

It can be readily appreciated why, if this is the case at any rate in certain parts of U.S.A., this particular handicap is rated there as the second highest in incidence of all handicapping conditions. It would not be surprising if authorities on the problem in that country were to assume that failure to give as much prominence to the problem in this country must mean that thousands of children here are being neglected, either through lack of ascertainment or by reason of lack of the necessary provision for suitable education and treatment.

It is therefore unfortunate that this suggested incidence of cases, found in New Jersey in 1940, should have been not only quoted and requoted in most of the American literature published since, but accepted as the expected incidence not only for the U.S.A. generally, but for this country.

Indeed, there is apparently already evidence, based on more recent investigations in U.S.*, that the hitherto supposed incidence is not in fact to be found generally in other areas. This matter of incidence is important since it is not merely a problem of academic interest, but is closely related to those problems of additional special provision, both for education and medical treatment, which might arise if it were proved that there were in this country a considerable number of cerebral palsied children who could profit satisfactorily from a special type of education if it were available.

In many American States, provision of welfare services is undertaken not directly by the local authority, but by voluntary societies, and there do not exist services exactly comparable to our School Health and Maternity and Child Welfare Services, with School Medical Officers and Health Visitors keeping in touch with children who require medical supervision from infancy until school-leaving age. It is less surprising then to find that many handicapped children may exist there for years unknown, undiagnosed and without any facilities for treatment or special education.

In such States as California, where compulsory school attendance is not enforced until a child is 8, the matter of appropriate educational provision presents a somewhat different problem. The average child in any country is not expected to have accomplished much in the way of formal skills before the compulsory age for schooling, and opinions regarding educability (except in obvious cases) are rarely made dogmatically until a child has had an opportunity of receiving education for about two years. If, however, a child's retardation is not sufficiently obvious for appropriate steps to be taken until he is about 10 years old (if he is not physically too incapacitated to attend a school) he may continue to be accepted as of normal educability long after a child of similar age in this country has been found to be incapable of profiting satisfactorily from ordinary primary education and has been either transferred to a special school or, if necessary, excluded from formal education schemes and reported to the Mental Deficiency Authorities for supervision. Again, age for age, a less advanced standard of attainment is expected from the American than from the average British child and, in proportion to the population, there is, in most States, less available special school provision.

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*Verbal communication, no actual report published yet. Assoc. for the Aid of Crippled Children. New York.

All these facts, apart from differences in the application of the term " educable " which in U.S.A. appears frequently to cover also such children as those whom in this country we should term only " trainable," should make us wary of applying uncritically to our own population certain statistics emanating from other countries with a different way of life.

The problem of the incidence of cerebral palsy, as in the case of most handicaps, is closely bound up with that of ascertainment which varies according to the efficiency with which cases are noted and differentiated. Some variation in the range of disabilities, which the general term cerebral palsy is taken to comprise, can also influence estimates of incidence. Until comparatively recently, little work had been done to investigate systematically the problem of incidence among children in this country, nor had there been any approach to the problem on any large scale. As a result of a growing interest in the subject, however, during the past three years attempts have been made by a few Local Authorities, both independently and at the instigation of the Ministry of Education, to discover the incidence of the handicap among children of school age (under 16 years) in their own areas. An attempt at co-ordinating as much as possible of the available data was made in 1948 by the Educational Advisory Committee of the British Council for the Welfare of Spastics. This body invited all L.E.A.s in England and Wales to complete a questionnaire relating to the various types of cerebral palsy found among children aged 16 years and under in their areas. Information was also sought in each area regarding sex incidence, usual mode of differential classification in use, range of intellectual capacity found among the children listed and available special provision for their care, treatment and education.

In response to this questionnaire 107 out of 147 L.E.A.s gave information, although only 101 Authorities supplied actual statistics in 1948. These 101 Authorities were as indicated under :—

TABLE LIV

	England	Wales	All
County Areas ..	30	7	37
County Boroughs ..	60	4	64
Total	90	11	101

These returns showed a degree of variation in incidence ranging (apart from one exceptionally high incidence of 4.4) from 0.1 to 2.4 per 1,000 of the child population, the average for all County areas being 0.7 and for County Boroughs 1.2 per 1,000 respectively, with an all-over average of 0.9 for England and Wales.

Further investigation of the returns indicated that the wider variations from the average could, in some degree and in some instances, be accounted for by the fact that in some areas the inquiry had been limited to children of primary and secondary school age only while, in others, children had been included who were in nursery schools or were of pre-school age.

Again, in some areas, children were included who, though formerly attending clinics and hospitals for symptoms diagnosed as probably those of cerebral palsy, had now either no apparent handicap, or residuals of so minor a degree that they had no difficulty in profiting satisfactorily and without restriction, from ordinary school education. In the one area from which the surprisingly high incidence of 4.4 per 1,000 was given, it should be noted that 18 out of the 30 cases mentioned were attending an ordinary school although special school provision was available in that area. Yet another factor tending to increase apparent incidence in certain areas was the inclusion of children whose major disability seemed primarily of a mental rather than a physical order. Incidence figures for the 37 County and 64 County Borough areas in England and Wales which supplied information are given in the following Table LV.

TABLE LV

Incidence of Cerebral Palsy Handicaps (among Children Aged 16 Years and Under) Compiled from Returns made by Local Authorities to a Questionnaire Issued by the British Council for the Welfare of Spastics, Educational Advisory Committee, 1948

1 (*a*) County Councils, England	Male	Female	Total	Child Pop. (Min. of Ed.) (thousands)	Incidence per 1,000
I	2	3	5	35	0.1
II	14	9	23	30	0.8
III	18	17	35	38	0.9
IV	52	34	86	88	1.0
V	13	18	31	52	0.6
VI	9	6	15	32	0.5
VII	22	19	41	131	0.3
VIII	31	29	60	54	1.1
IX	54	40	94	69	1.4
X	9	9	18	15	1.2
XI	18	7	25	64	0.4
XII	64	48	112	175	0.6
XIII	15	13	28	43	0.7
XIV	11	7	18	14	1.3
XV	7	7	14	40	0.3
XVI	121	77	198	254	0.8
XVII	37	25	62	43	1.4
XVIII	9	8	17	54	0.3
XIX	29	20	49	67	0.7
XX	10	13	23	20	1.1
XXI	30	16	46	51	0.9
XXII	20	17	37	113	0.3
XXIII	8	7	15	25	0.6
XXIV	4	4	8	13	0.6
XXV	53	42	95	133	0.7
XXVI	14	7	21	32	0.7
XXVII	3	3	6	8	0.7
XXVIII	6	6	12	10	1.2
XXIX	33	30	63	42	1.5
XXX	4	3	7	25	0.3
30 English County Areas	720	544	1264	1770	0.7

1 (*b*) County Councils, Wales	Male	Female	Total	Child Pop. (Min. of Ed.) (thousands)	Incidence per 1,000
I	11	7	18	7	2.6
II	16	8	24	8	3.0
III	8	11	19	17	1.1
IV	16	20	36	24	1.5
V	22	17	39	113	0.3
VI	2	6	8	6	1.3
VII	11	10	21	13	1.6
7 Welsh County Areas..	86	79	165	188	0.9
All 37 County Areas ..	806	623	1429	1958	0.7

2 (*a*) County Boroughs England	Male	Female	Total	Child Pop. (Min. of Ed.) (thousands)	Incidence per 1,000
I	5	7	12	9	1.3
II	2	4	6	8	0.7
III	15	16	31	19	1.6
IV	5	6	11	13	0.8
V	8	8	16	14	1.1
VI	7	4	11	11	1.0
VII	6	6	12	13	0.9
VIII	16	21	37	37	1.0
IX	9	7	16	17	0.9
X	42	45	87	50	1.7
XI	13	2	15	10	1.5
XII	1	2	3	7	0.4
XIII	18	12	30	7	4.4
XIV	7	8	15	9	1.7
XV	2	2	4	6	0.7
XVI	17	15	32	26	1.2
XVII	8	5	13	11	1.2
XVIII	16	4	20	19	1.1
XIX	6	5	11	7	1.6
XX	10	6	16	10	1.6
XXI	2	4	6	5	1.2
XXII	12	5	17	8	2.1
XXIII	9	13	22	16	1.4
XXIV	4	5	9	6	1.5
XXV	6	7	13	13	1.0
XXVI	9	9	18	11	1.6
XXVII	7	6	13	12	1.1
XXVIII	5	17	22	44	0.5
XXIX	50	47	97	64	1.5
XXX	23	22	45	37	1.4
XXXI	1	3	4	9	0.4
XXXII	82	73	155	124	1.2
XXXIII	37	24	61	94	0.6
XXXIV	7	2	9	24	0.4
XXXV	18	3	21	37	0.6
XXXVI	3	3	6	11	0.5
XXXVII	11	17	28	14	2.0
XXXVIII	14	12	26	14	1.8
XXXIX	21	13	34	26	1.3
XL	8	6	14	15	0.9
XLI	11	10	21	14	1.5
XLII	3	1	4	10	0.4
XLIII	3	9	12	12	1.0
XLIV	11	10	21	18	1.2
	570	506	1076	941	—

(*cont.*)

County Boroughs, England (*cont.*)	Male	Female	Total	Child Pop. (Min. of Ed.) (thousands)	Incidence per 1,000
	570	506	1076	941	—
XLV	28	22	50	25	2.0
XLVI	67	65	132	68	1.9
XLVII	10	4	14	10	1.4
XLVIII	10	5	15	22	0.7
XLIX	10	13	23	16	1.4
L	8	13	21	44	0.5
LI	13	5	18	28	0.7
LII	5	1	6	9	0.7
LIII	6	3	9	8	1.1
LIV	14	15	29	12	2.4
LV	6	7	13	17	0.8
LVI	9	7	16	12	1.3
LVII	9	5	14	25	0.6
LVIII	0	2	2	10	0.2
LIX	13	16	29	24	1.2
LX	6	9	15	14	1.1
60 English County Boroughs	784	698	1482	1285	1.2
2 (*b*) County Boroughs, Wales					
I	29	17	46	33	1.4
II	12	7	19	10	1.9
III	3	10	13	14	0.9
IV	31	10	41	21	2.0
4 Welsh County Boroughs	75	44	119	78	1.5
Total 64 County Boroughs	859	742	1601	1363	1.2
Total for 101 Areas ..	1665	1365	3030	3321	0.9

In the above Table LV showing the total and sex incidence of all cases reported by the local authorities who completed the questionnaire, the approximate incidence of children with cerebral palsy per 1,000 child population is shown for each area. The child population figures (given in thousands) are those issued officially by the Ministry of Education as " Children on the Registers of Primary and Secondary Schools (other than Nursery Schools and Special Schools) aged 2–16 years on January 1948."

It should be noted that the omission of the total population in nursery and special schools and of pre-school age children would, if anything, reduce slightly the incidence as expressed per 1,000. It may be shown that, by adding to the given child population figures a further 120,000 to cover the total number of children in special schools in England and Wales, very little difference would be made in the final estimate of the incidence per thousand children in the total population. A rather more significant difference might be made in the figures for those urban areas in which provision for special education of all types is greater and in which a possibly larger than average attendance at nursery schools of children aged 2 to 5 ensures a more thorough knowledge of the difficulties of handicapped children of pre-school age. Such areas, with more efficient education and health services, have, however, tended to make returns referring to all children in the area, whether or not on the register of any primary or secondary school. Returns from these areas therefore tend to show a slightly larger proportionate incidence when expressed as a fraction of the primary and secondary schools populations only.

For several reasons it was not safe to assume that the higher incidence rates given were necessarily the more accurate. Results from later special investigations indicated that few, if any, cases had been missed but that in some areas (e.g. C.B., X.) the original number had been an over-estimation through the inclusion of cases found to have been wrongly classified.

Before the issue of the British Council for Welfare of Spastics questionnaire, an approach had already been made to several local authorities in connection with the investigation being carried out by the National Foundation for Educational Research.

Areas invited to co-operate in a more detailed investigation were those in particular which not only showed interest in the inquiry, but which had on their staffs either an experienced educational psychologist working in close co-operation with members of the school health service, or a school medical officer familiar with the assessment of handicapped children's abilities and attainments. As it was likely that in the limited time available detailed work could be carried out only in relatively few areas, it was decided to choose for comparison samples of urban and rural areas which would include industrial and residential districts. Rural areas included those adjacent to urban districts possessing good health services, as well as those which were more remote and in which special schools, clinics and hospitals, where they existed, were fewer and less accessible.

By permission of the local authorities and the co-operation of the officers concerned, more detailed information was obtained from the following ten areas.

(*a*) *County Boroughs*
X, XXIX,
XXXII, XXXVI,
XL, LIV,
A (Not included in the B.C.W.S. Returns)

(*b*) *County Areas*
C (Not included in
D B.C.W.S. Returns)
XX

Apart from its value in other ways, the detailed information obtained about individual cases from these areas served, in some measure, and for the following reasons, as a check upon the figures supplied in response to the British Council for Welfare of Spastics questionnaire.

1. The inquiry conducted by questionnaire, being done by correspondence and for preliminary survey purposes only, could not deal with individual cases or be concerned with detailed histories. In the ten areas mentioned above however, personal contacts were made during which considerable discussion took place, with various members of the local authorities' staffs and other persons, regarding the types of children with which the special investigation was concerned and the many problems which these children presented.

2. Information additional to that available through the local authorities' records, regarding children both already attending and known to be excluded from schools as well as any not already known to be on any register, could be obtained from agents such as social and welfare workers, almoners, mental deficiency committee officers, doctors and others who had had contact with these children.

3. By virtue of the good co-operation and understanding existing between the officers of the local authorites and the parents of the children concerned, it was possible in some areas for home visits to be arranged from which not only the research but the parents of the children benefited. From the point of view of the research, it was invaluable to be able to observe especially the more handicapped children in their familiar environment. There was then opportunity not only to note the difficulties which these children were then presenting and to make some assessment of their probable capacity for improvement, but also to gather from their parents, in an informal way, information about their earlier development. From the parents' point of view the visits were, without exception, appreciated not only for such practical suggestions as it was often possible to make concerning the encouragement of a greater measure of social independence in their children, but no less, in many instances, for a less concrete reason. The opportunity which the occasion of such visits offered to parents to discuss their own attitudes to the difficulties with which they had been struggling, often for several years, served in many cases to relieve in some measure a number of anxieties connected with their children's handicaps. This matter will be dealt with at greater length in another part of this report. All cases of the handicap found, after as thorough as possible a search of the 10 chosen areas and inquiry at all available sources of likely information, resulted in the following incidence figures per 1,000 (Child Population) closely comparable to those submitted in response to the postal questionnaire.

Table LVI

	Male	Female	Total	Child Population (thous.)*	Incidence per 1,000
County Areas					
C	5	9	14	20	0.7
D	14	11	25	31	0.8
XX	11	18	29	20	1.4
Total 3 County Areas ..	30	38	68	71	0.9
County Boroughs					
X	36	42	78	50	1.5
XXIX	57	50	107	69	1.5
XXXII	82	73	155	124	1.2
XXXVI	4	2	6	11	0.5
A	5	4	9	12	0.7
XL	10	7	17	16	1.0
LIV	13	14	27	12	2.2
Total 7 County Boroughs	207	192	399	294	1.3
Total all 10 Areas ..	237	230	467	365	1.3

*Education Committees' Year Book, 1948.

It will be seen that, as a result of more intensive investigation, in some areas a very few more cases were found than had already been noted in the British Council for Welfare of Spastics questionnaire returns, while in other areas there were fewer cases of cerebral palsy than had previously been supposed. The largest increase noted (C.B. XXIX 10 additional cases) in a county borough in which the school population, according to the Education Committees' Year Book for 1948, was 69,000, left the incidence of 1.5 per 1,000 unaltered.

One rural county (XX) and the adjacent county borough (A) for which the figures given for the more intensive survey may be considered of maximum possible reliability are of particular interest for comparison.

The county area, though geographically extensive, has a scattered but not very large population; while the county borough, with a child population approximately 3/5ths the size of that of the county, is a comparatively compact area.

Both areas however, in addition to good school health services have access to the same excellent hospital services and in particular to two hospitals both famous for neurological and orthopædic work. Through the kind services of doctors and almoners at these hospitals and of the education officers, psychologists, and the mental welfare and other social workers in these areas, mention of every cerebral palsy handicapped child who at any time had come to their notice was ensured. In most cases, with the exception of a few very young children, it was found that cases referred through these agencies were already known to the school health and the maternity and child welfare services. However, even so, it was often possible to obtained useful additional information about the children's early development and response to any treatment that had been given.

In two other comparable areas, D and XXXVI comprising a rural county and an adjacent county borough, in which the hospitals again served both areas and between which the services of the same educational psychologist were shared, much the same exhaustive search for handicapped children was made. In the three large cities X, XXIX, and XXXII in which thorough investigations were made, the resulting incidence in each case was a little higher than that found in the smaller county boroughs (e.g., A and XL) in which equally careful search gave incidences of 0.7 and 1.0 respectively.

Contrary to a general tendency for more cases of cerebral palsy to be found in towns than in country districts, owing to the tendency of such cases to gravitate to the more urban districts with better provision for special treatment, it will be noted that D and XX both showed a rather higher incidence than was found in their respective neighbouring county boroughs.

The difference between the incidence found in A and in XX seemed surprisingly large, but further examination of the individual records showed that 5 out of the 29 children in XX were under the age of 5. The child population figures on which the incidence per 1,000 was calculated referred, however, to children aged 2 to 16 years who were on the registers of primary and secondary schools. Since in fact, they ignored those children aged 2 to 5 years who were in Nursery Schools and all other pre-school children, other than the relative few aged 2–5 years to be found in nursery classes of primary schools, a more accurate estimate of incidence would be given, if the (M. of E.) child population figures were taken as referring only to children of 5 years and over.

That is to say the approximate thousands of child population referred to in Tables LV and LVI referred, in fact, to only approximately three-quarters of the total child population aged 0–16 years.

Where, therefore, it has been possible to abstract from available data the number of cerebral palsied children aged under 5 years and to express the incidence of those aged 5–16 years only as " x per 1,000 " of children receiving primary and secondary education, the resulting incidence is shown in Tables LVII (*a*) and LVII (*b*). In these Tables estimates have also been made of (1) the proportional incidence of cerebral palsied children likely to be found in the total population of children aged 0 to 16 years (the figures for this total population having been adjusted to include children under 5) and (2) the probable proportional incidence of the handicap in children under 5 years, this proportion being that of the declared incidence of cerebral palsied children under 5 in relation to the probable population of children to be found in that age range, this probable population having been calculated from the known population of children aged 5 to 16 years.

For all areas the most reliable figures are those obtained for children aged 5 to 16 years. Within this age range, children are more likely to come to the notice of those responsible for the education and health of school-age children. By the age of 5 years many children, whose handicap was either not very apparent or remained undiagnosed in the earlier years, are recognized as unsuited to the normal education schemes, by reason of their handicap.

It will be seen that, for the special investigation areas (Table LVII (*a*)) the overall incidence for both urban and rural districts is only 1.2 per 1,000 children and that the average difference between the incidence or the handicap found respectively in towns and in rural districts is only 0.5 per 1,000. This slight average increment for towns is not however constant since, among the areas in which particular care was taken to investigate every case which could be found, the lowest incidence (0.5) was found in a Borough.

In view of statements that from time to time have been and are still being made, to the effect that " thousands " of children handicapped by cerebral palsy exist forgotten and untouched by educational and treatment schemes, it is interesting to note that both the range of incidence and the average incidence found, in both urban and rural districts in those areas in which specially intensive surveys were made, were almost identical with those reported from other places. This would seem to indicate that, in fact, very few cerebral palsied children of school age are unknown to the L.E.A.s. On the basis of an approximate 1 per 1,000 general incidence among children, it may be estimated that, out of the total population of school-age children (5,325,000 in January 1948), there would be approximately 5,325 cerebral palsied children in England and Wales.

In this country and elsewhere it has, until recently, been commonly supposed that a high proportion of cases was due to " birth injury." In U.S.A. certain authorities have found that there appears to be no significantly greater incidence of the handicap in remote areas, in which obstetrical services are non-existent, than in cities with every facility for pre-natal, natal, and post-natal care. The very similar proportionate incidence found in urban and rural districts respectively in England and Wales supports the evidence that other factors than " birth injury " must be sought to account for a large proportion of cases.

In the matter of general incidence, however, the findings in this country appear to diverge widely from those so far claimed in America,

TABLE LVII (*a*)

Special Surveys. (*Selected Areas*)

(1) Counties	C.P. Children aged 5–16 yrs.	School Population (approx. thousands)	Incidence per 1,000	C.P. Children aged 0–16 yrs.	Estimated Population 0–16 yrs. (approx.) thousands)	Estimated Incidence per 1,000	C.P. Children aged 0–5 yrs.	Estimated Population 0–5 yrs. (approx. thousands)	Estimated Incidence per 1,000
C	14	20	0.7	—	—	—	—	—	—
D	23	32	0.7	25	43	0.6	2	13	0.1
XX	24	20	1.2	29	27	1.0	5	6	0.8
3 Counties Total	61	72	0.8	54	70	0.8	7	19	0.4
(2) Boroughs									
X	78	50	1.5	—	—	—	—	—	—
XXIX	105	69	1.5	107	91	1.2	2	22	0.1
XXXVI	5	11	0.4	6	15	0.4	1	4	0.2
A	7	12	0.6	9	16	0.6	2	4	0.5
XL	15	16	0.9	17	21	0.8	2	5	0.4
LIV	20	12	1.7	27	16	1.7	7	4	1.7
5 Boroughs Total	230	170	1.3	166	159	1.0	14	39	0.4
Total all Selected Areas ..	291	242	1.2	220	229	0.9	21	58	0.4

Table LVII (*b*)

(Based on B.C.W.S. Questionnaire Returns)

1 (*a*) Counties England	C.P. Children aged 5–16 yrs.	School Population (approx. thousands)	Incidence per 1,000	C.P. Children aged 0–16 yrs.	Estimated Population 0–16 yrs. (approx.) thousands)	Estimated Incidence per 1,000	C.P. Children aged 0–5 yrs.	Estimated Population 0–5 yrs. (approx. thousands)	Estimated Incidence per 1,000
IV	73	88	0.8	86	117	0.5	13	29	0.4
VI	13	32	0.4	15	43	0.3	2	11	0.2
XXVI	15	32	0.5	21	43	0.5	5	11	0.5
3 Counties, England ..	101	152	0.6	122	203	0.6	20	51	0.4
1 (*b*) Counties, Wales									
III	14	17	0.8	19	23	0.8	5	6	0.8
IV	25	24	1.0	36	32	1.1	11	8	1.4
V	35	113	0.3	39	151	0.3	4	38	0.1
VII	17	13	1.3	21	17	1.2	4	4	1.0
4 Counties, Wales	91	167	0.5	115	223	0.5	24	56	0.4
Total 7 Counties, England and Wales	192	319	0.6	237	426	0.6	44	107	0.4

TABLE LVII (*b*) (*cont.*)

2 (*a*) Boroughs, England	C.P. Children aged 5–16 yrs.	School Population (approx. thousands)	Incidence per 1,000	C.P. Children aged 0–16 yrs.	Estimated Population 0–16 yrs. (approx.) thousands)	Estimated Incidence per 1,000	C.P. Children aged 0–5 yrs.	Estimated Population 0–5 yrs. (approx. thousands)	Estimated Incidence per 1,000
I	9	9	1.0	12	12	1.0	3	3	1.0
VII	8	13	0.6	12	17	0.7	4	4	1.0
VIII	29	37	0.8	37	49	0.7	8	12	0.7
XVIII	18	19	0.9	20	25	0.8	2	6	0.3
XXI	3	5	0.6	6	7	0.8	3	2	1.5
XXII	12	8	1.5	17	11	1.5	5	3	1.7
XXXV	19	37	0.5	21	49	0.4	2	12	0.2
XLIII	7	12	0.6	12	16	0.7	5	4	1.2
XLIV	17	19	0.9	21	24	0.9	4	5	0.8
XLV	33	25	1.3	50	33	1.5	17	8	2.1
Total 10 Boroughs, England	155	184	0.8	208	243	0.9	53	59	0.9
2 (*b*) Boroughs, Wales									
IV	32	21	1.5	41	28	1.4	9	7	1.3
All 11 Boroughs (England and Wales)	187	205	0.9	249	271	0.9	62	66	0.9
Total all 18 Areas (England and Wales)	379	524	0.7	486	697	0.7	106	173	0.6

where the accepted figure has been approximately that of 96 cerebral palsied children (0 to 16 years) in every total population of 100,000 persons. Assuming that in U.S.A. the proportion of children to adults in the population approximates to that found in Great Britain (where the child population aged 0–16 (10,311,000) accounts for between a quarter and a fifth of the total (43,000,000), there would be approximately between 3.8 and 4.8 cerebral palsied children per 1,000, or between four and five times the average incidence found in this country. This large presumed incidence has not actually been found other than in a survey made in New Jersey, the results of which have been accepted very largely as indicative of the expected incidence elsewhere. It should be noted however that, for example, the incidence of cerebral palsied children in Illinois (given by the Illinois Commission for Handicapped Children 1943) was approximately 50 per 100,000 total population—i.e., roughly 2–2.5 per 1,000 children, or only half that given by the New Jersey survey, though still more than twice the average in this country.

Again, from a State-wide survey, made by the Department of Education in California,[9] of children within the compulsory school age range 8 to 16 years, the reports yielded evidence of 798 children allocated as follows :—

Attending Public (Elementary) Schools	457
,, Private ,,	54
,, State ,,	2
In State Institution for Feeble Minded	186
Not attending School	99
Total	798

Although some children with an extremely mild involvement may have been missed, these are unlikely to have been those needing any special provision. Doubling the above yield (which in fact relates to 9 out of the 16 years of age range required) in order to obtain an estimate of the approximate incidence for all cerebral palsied children between 0 and 16 years, would in all probability more than compensate for any omissions. The resulting 1,600 cases of children with the handicap in a total State population of 8,000,000, with between 1,600,000 and 2,000,000 children in the 0 to 16 years age range, would give an incidence of between 0.8 to 1.0 per 1,000 of the child population. This last estimate it should be noted is almost identical with that found in this country.

How do these figures compare with those relating to other handicaps? The following rough estimates of the proportion of registered pupils who suffer from particular disabilities and therefore require special educational treatment are (with the exception of those for diabetic children) quoted from " Special Educational Treatment " (M. of Ed. Pamphlet No. 5, H.M.S.O. 1946).[77]

Type of Disability	*Incidence per* 1000 *Registered Pupils*
1. Educationally subnormal	100
2. Speech defects	15–30
3. Delicate	10–20
4. Maladjusted	10
5. Physically handicapped	5–8
6. Partially deaf	1 and upwards
7. Partially sighted	1
8. Deaf	1
9. Blind	0.3
10. Epileptic	0.2
11. Diabetic	0.2

The estimate of the incidence of cerebral palsy would seem to approximate most nearly to those relating to the sensory defects (sight and hearing).

(*b*) *Future Organization*

From the evidence presented already we can conclude that, among cerebral palsied children whose degree or type of difficulty prevents their attending a school for physically handicapped children, between 70 per cent. and 80 per cent. are of an intellectual dullness which debars them from making any satisfactory response to formal education even at a special school exclusively for children with a cerebral palsy handicap.

Of the remaining 20 per cent. to 30 per cent., who may be said to be intellectually within the broadest limits of " normal " range, more than half are either dull or at best " low average " and less than 1 per cent. can be considered as potentially superior.

We have shown that nearly half of even a highly selected group admitted to a " dual purpose " school made either negligible educational progress, or none at all, over periods of attendance varying from approximately one to over two and a half years and that only between one quarter and one third of the children showed as much as a 50 per cent. rate of progress. The children who progressed to this extent however were, almost without exception, children with an IQ above 85; among those of poorer capacity, educational progress was in most cases almost imperceptible. Among even those of " low normal " ability (IQ 85–99) scarcely one child in three made as much as a 50 per cent. progress, and little more than half of those very few children of relatively superior capacity advanced at this rate.

We have seen that, from among this school group, those children who had, at some earlier period, attended either an ordinary school, or a school for physically handicapped children, were found to have made some educational advance more frequently than those children who had not had the benefit of schooling free from the simultaneous demands of an intensive therapy programme. What then are the indications for special education among all these children, many of whom would never be capable of work at a school for the physically handicapped, let alone at an ordinary school? We shall consider first the matter of suitable types of organization and secondly the question of the probable extent of provision necessary for each type.

The evidence of our data and observations would suggest that, during the early school age years, attention could more profitably be directed to the social and physical aspects of training than to formal education. If social and physical training is begun sufficiently early, by the time children are about 9 years old it should be possible to differentiate between those on the one hand who have made good enough general progress to enable them to profit significantly from formal education, and those who are unlikely to do so.

Those who have made the necessary general progress could then, between 9 and 10 years (if not before), be transferred to special schools for cerebral palsied children whose purpose would be definitely educational rather than physical treatment. The need for intensive therapy should no longer be required, any need for physical treatment being met adequately by the medical services usually available at other types of schools for handicapped children. This suggestion seems justified in view of the evidence that children capable of attempting formal work make better educational progress when their energy is not simultaneously being drawn upon by demands of intensive physical treatment. Children suitable for such transfer would, however, need to be of an intellectual level at least within " normal " range and for those with a cerebral palsy handicap this would be certainly not less than approximately IQ 85.

Such a scheme would still leave without provision the greater proportion of the more handicapped children 9 years of age and over who have insufficient ability to make the educational progress necessary to enable them to leave school with a reasonable facility in at least the basic subjects. On the basis of our evidence it would seem that for these children much formal education is largely a waste of time and effort, resulting in little or no real profit to them. We consider that such children would benefit more from a scheme of " education for living," the main purpose of which would be to encourage a better degree of social independence and adjustment. Such a scheme could provide training in such occupations as would be within the limits of the mental and physical capacities of these children and would continue to afford them an interest after they had left the school or centre. In some cases such training might even lead to their earning a little under one of the sheltered workshop schemes for light home crafts.

To what extent would such schemes of provision as we have suggested be required? It is possible only to suggest very approximate numbers, since it has not been possible to get all the necessary information about those cerebral palsied children, including those very lightly handicapped, who are already attending other special schools.

We have, however, calculated that the total incidence of children with the handicap in this country (England and Wales) is likely to be about 5,300. Of this number approximately 50 per cent. are so slightly handicapped as to be able to attend ordinary schools. Of a further approximately 20 per cent. able to attend special schools some, being only slightly handicapped, would be likely to gain no educational benefit by transferring to a school exclusively for cerebral palsied children, while others, whose handicap shows mainly in a degree of mental subnormality, would do better in schools for educationally subnormal children which either they at present attend, or to which they could most suitably be transferred. Unfortunately we do not know the proportion of those children now attending special schools who might benefit educationally by transferring to a school exclusively for cerebral palsied children. Judging, however, by those from schools for physically handicapped children who from time to time were considered for vacancies at a special dual purpose school for cerebral palsied children, the number is not likely to be very high. Most of those for whom application was made were considered to be more suitably placed in the schools which they are already attending, and in most cases were judged not to require the intensive physical treatment given at the school for cerebral palsied children.

If therefore we take only those children who are not already suitably provided for, the resulting incidence would be approximately 1,600 children between 5 and 16 years.

If, as we would suggest, dual purpose centres be established mainly for children up to the age of approximately 9 years, the need for accommodation for children of this age range at such centres would be likely to exceed considerably that required for older children. A proportion of these latter would, at about the age of 10 years, be capable of responding to more purely educational schemes, while others would already have been found to require either home or institutional care. There would of course be some, too handicapped for formal education, who could with profit continue in a dual purpose system between the ages of 10 and 16, if occupation centres were not provided.

At the dual purpose centres education should not be formal. Though serving for some children as a preparation for the more purely educational schemes for which they would ultimately be eligible, it should consist mainly of such activities as would be closely linked with the social training and physical treatment which all would receive until the age of about 9 years. Such social and motor training would need, at this stage, to have admitted precedence if the fullest possible reduction of physical disability were to be achieved by the age at which it is suggested that more formal education could most appropriately begin.

Such centres might therefore need to provide places for as many as from 800 to 900 children between the ages of 5 and 9 years, if we make the necessary allowance for a proportion (35 per cent. to 40 per cent.) of children of this age range who would be too seriously handicapped, physically or mentally, to be able to make any general social or physical progress, even with intensive training, and would already be recognized as suitable only for home or institutional care.

Some of the 800–900 children suitable for such centres as we propose would probably need to be there for a relatively short time. These would be children who, being more lightly handicapped and mentally more capable, would make more rapid progress and would probably do better to transfer direct to schools for physically handicapped children as soon as they were capable of meeting the necessary physical and intellectual demands.

It would be expected therefore that the turnover of children at these centres would be higher than at the schools and it is consequently very difficult to suggest even the approximate numbers for whom, at any one time, accommodation would be required. It is possible, however, that such centres could cope with at least as many children as would be an economic number for the special schools (approximately 40) and, if this were so, about 20 centres might be required for the whole country. There would be no necessity, however, for either all of these to be residential, or for the residential centres entirely to exclude day pupils, for it is usually best for the younger children whenever possible to have a closer contact with their homes and families than can be arranged when they are in residential centres. From the point of view of the parents also day centres are often better, since a closer contact can be maintained between parents and staff and necessary help and guidance be given more opportunely than when this must be done briefly at infrequent intervals, or even by correspondence alone.

The number of those who, by the age of 9+ years, would be unlikely to benefit to any very useful extent from more formal education would be approximately from 600 to 700. Of this number, however, there would be probably as many as between 250 and 300 who, by reason either of too gross a physical or mental handicap, would profit little even from a scheme of occupational training and who would be fitted only for home or institutional care. They would leave roughly from 400 to 450 children who, though not very educable in the formal sense, might be capable of being taught sufficient of such simple occupations as would provide them with at least an interest and pastime when they reached school leaving age. None of these children would be likely to be eventually self supporting, but a few might conceivably at some time earn a little under one of the sheltered workshop light home industry schemes.

For most of those children the ordinary occupation centres for notified mental defectives would not be the most appropriate setting. When occasionally such centres have admitted them however it has been obvious that these children have more often than not derived benefit from opportunities for social contacts which would not otherwise have been available, apart from any benefits derived from participation in the actual activities of such centres. Centres for cerebral palsied children who, though not actually mentally defective, are sufficiently mentally and physically handicapped to be unable to profit from other types of education, do not at present exist. It is, however, in the form of such centres that additional special provision for these children is urgently required.

Though a certain number of them might with profit continue at a dual-purpose centre until the age of 16 years, too wide an age range at such centres would probably involve many administrative difficulties.

As regards children with sufficient intelligence eventually to make reasonable educational progress, there are not likely to be more than from 320 to 480. Of this number, however, only a proportion of approximately 6/11 would at any one time be of an age to make a satisfactory response at schools where school education rather than physical treatment and social training was the main purpose.

The special school accommodation needed for such children, that is to say, would not be likely to exceed that required for between 175 and 260 children.

If each such special school were to provide for about 40 children, the required number of schools to accommodate those of suitable age and intelligence would, for England and Wales, be probably not less than four and certainly not more than six, if all eligible children received full-time education from the age of 10 to 16 years. Such an estimate is a generous rather than a conservative one, since the incidence of children on which we have based this figure will include some who, in spite of potentially adequate intelligence and suitable age, by reason of either too severe a degree of handicap or the multiplicity of their difficulties and concomitant defects, would profit too little to allow them ever to be classified as other than " ineducable." It is improbable that the number likely to be able to profit to a reasonable degree from education has been underestimated. This is borne out by the fact that the two or three special schools for cerebral palsied children exclusively which have been established within the past 3 years, though not lacking in applicants, have had the greatest difficulty in finding sufficient children of the type for whom these schools were intended, and have been obliged to accept many children who, for one or another reason, were not really suitable. Should there be any great increase in the number of schools for physically handicapped children prepared to make provision, in special classes or an annexe, for those with cerebral palsy who require rather more individual attention than can usually be afforded with a normal quota of staff, the need for special schools exclusively for such children would be even less than has been suggested.

(*c*) *Parent Guidance*

Even the most co-operative and intelligent parents of these children are apt to need guidance at times, if only because they tend to expect too rapid a rate of progress and themselves become over-anxious and prematurely discouraged when the standards they set cannot be reached quickly enough by the child. When standards are high and patience soon lost, many things which the child himself should be attempting, with increasing independent effort and decreasing help from others, continue to be done for him. He is thus encouraged to remain a passive recipient, incentive to further effort is lost, and a regrettable attitude to the necessity for self help is inculcated which may adversely affect progress both general and educational.

Much the same effect may also result from the kind of behaviour on the part of the parents which springs from a completely opposite attitude. Many parents grow so accustomed to an overprolonged state of dependence in their child that they remain apparently unaware of the passage of years and make no further social demands on their child at 10 years than they did at 10 months. Their misguided solicitude is then as bad eventually for themselves and other members of their family as for the handicapped child himself. Not only is he deprived of any incentive to effort, but there tends to be fostered in him a self-centred attitude. This, as he gets older, leads to his expecting to be able to act as an autocrat in his home and for the interests and well-being of others always to be subjected to his own interests and wishes. Where he has siblings they, rather than the handicapped child, are often ultimately more deserving of pity in families where such a situation is to be found. It is often unfortunately too late before parents realize the harm which they have quite unwittingly done to family relationships which consciously they would be the last to wish to disrupt.

Where parents are given opportunities to discuss matters which, though not ostensibly concerned with specific details of training and education, have nevertheless an important bearing and influence on the child's own attitude to his progress, both are likely to benefit. There is a much greater likelihood that the child will eventually make the maximum use of any opportunity for education which can be afforded him and both he and his parents are more likely to come to terms with such residual handicaps as, in spite of every effort, must remain.

In conclusion, whatever the degree, or extent, of handicap and whatever the possibilities for care, treatment and education, we would stress Moragas'[48] final injunction that two conditions are prime essentials to adjustment—" a healthy atmosphere and a sane outlook."

APPENDIX

ÆTIOLOGY OF CEREBRAL PALSY AND SOME OBSERVATIONS CONCERNING BIRTH HISTORIES

SUMMARY

(i) Ætiological Theories

Brief mention is made of various theories concerning cerebral palsy which have been held during the past 120 years. Theories have tended successively to attribute the prime cause of the handicap to endogenous rather than exogenous factors.

(ii) Birth Abnormalities

The birth histories of a large number of cerebral palsied children are considered with special reference to certain abnormal conditions and birth order. Some support is adduced for the theory that cerebral palsy occurs more frequently in first pregnancies than in subsequent ones.

Asphyxia and prematurity are found most commonly in the histories and probably tend to weed out at an early stage those with multiple defects.

A history of convulsions in particular is found to decrease eventual educability.

(i) Some Ætiological Theories

In the study of any problem, the various theories put forward in explanation from time to time are at least of interest historically. In many cases these theories, though possibly abandoned as more evidence accumulates and as advances in knowledge are made, may yet continue to offer suggestions for further inquiry along certain lines.

In a study of recent advances in the ætiology and treatment of the cerebral palsies of childhood, H. Keith Lucas [42] mentions that as early as 1828 Joerg referred to the fact that " . . . too early and unripe born children may present a state of weakness and stiffness in the muscles."

Most references, however, to the history of the recognition of the conditions now subsumed under the general term " cerebral palsy " cite Dr. Little[38] (Senior Physician at the London Hospital) as the first to describe the syndrome at all fully. In 1841 he published in " The Lancet " an article on spasticity in new born infants and twenty years later, in 1861, presented a paper [39] to the Obstetrical Society on " The influence of abnormal parturition, difficult labour, premature birth and asphyxia neonatorum on the child, especially in relation to deformities."

This paper, based on observation of 200 cases over a 20-year period, presented the clinical picture so clearly that, in many respects, little more could be added to it to-day.

It is particularly interesting to note that, in 1853, Little emphasized the influence of ante-natal factors as probably likely to prove of greater importance in the resulting condition than any actual focal injury to the brain. Since his day, alternative theories which have been advanced in favour variously of meningeal hæmorrhage, birth asphyxia, prematurity and consequent arrest of myelination of the nervous system, have all in turn, for want of adequate positive evidence or for lack of the necessary " negative " evidence, had to be not so much abandoned as recognized to be probably only contributory to the prime cause or even as secondary effects of it. (Reference to many of these theories may be found in Ford's[20] account of the various controversies.) Against Little's earlier inclination to discount mechanical birth injury as the main cause of cerebral palsy conditions, the view, for example, that meningeal hæmorrhage was precursor to gyral atrophy was again advanced 30 years later by Dr. Sarah McNutt[46] [47] in 1885 and supported by Gowers[25] and Osler.[54] Though her thesis was based on the rather inadequate evidence of two cases only and has received little support from investigations made since, the opinion has been expressed by more than one neurological authority that further inquiry is needed into other mechanisms which may, at some stage, involve hæmorrhages capable of injuring the cortex. Both Byers[8] and Norman[49] refer to investigations by Schwartz (1924 and 1927) and by Schwartz and Fink (1926) which indicated a " hitherto unsuspected frequency of multiple intra-cerebral hæmorrhages and softenings which occurred in the early stages of atrophic sclerosis." Norman's own findings were in line with their conclusion which, according to Byers, " has never been accorded the recognition it merits."

Attractive though the birth-injury theory may have been (and still in some quarters continues to be) and in spite of the fact that the parents of cerebral palsied children might, for obvious psychological reasons, prefer to regard their children's disabilities as adventitious rather than endogenous, the fact must be admitted that the theory is insufficiently supported by evidence. Since Little's early indication that in the ætiology of the condition we must look primarily to other causes, there has been accumulating a considerable weight of evidence that, although obstetrical complications may be found in the histories of a proportion of cerebral palsy cases, these difficulties and abnormalities are more likely to be concomitant than causal factors. In 1897, Friend[22] published a monograph on the subject in which he expressed a view held later by J. S. Collier[11] [12] [13] and others that in most cases of diplegia the arrest of development occurs " in utero " and that " premature, precipitate and difficult births are not causal factors in the production of diplegia ; they are only associated symptoms of deeper lying influences which have dominated the development of the fœtus in the mother: the only cerebral paralysis which results from difficult birth occurs when the brain is lacerated and this takes the form of a monoplegia or hemiplegia or rarely of a double hemiplegia."

These views have been subscribed to more recently by Russell Brain,[5] and further supported, in the case of diplegia, by Patten[55] and others and, with reference to congenital athetosis, by the work of Oppenheim and Vogt on "état marbré."

In 1942, R. M. Stewart[69] gave strong support to earlier views regarding the importance of pre-natal factors in the ætiology of the cerebral palsies and, in 1946, Ford[21] after examining the theories attributing cerebral palsy conditions respectively to asphyxia, natal cerebral hæmorrhage and intra-uterine degenerative and toxic factors, concluded that the last group is the most important. Within the last group would, of course, be included such possible causes as Landsteiner and Wiener's "rhesus factor," which was not discovered until 1937 and not related to birth difficulties until Levine, four or five years later, had investigated the factor in relation to stillbirths and children born with a jaundiced appearance. The claim in 1947 of J. W. Papez (of Cornell University) that he had, at a magnification of 1,800 times, made visible a virus within the brain cells to which he attributed the prime cause of all but a relatively small percentage of cases of cerebral palsy, would, if he has since been able further to substantiate his claim, also lend support to the "toxic factor" school of thought.

The above brief references to various ætiological theories are given in this study, which is mainly concerned with the educational aspects of the many problems which cerebral palsied children present, because it is necessary not only to emphasize that no one easily differentiated and strictly defined cause has been found to account for the various forms of the handicap, but also to make clear that the physical signs of the handicap, which in themselves are often serious obstacles to normal education, are referable to abnormal conditions in the brain and nervous system. Because the resulting handicapping symptoms are of central origin, those undertaking the education of these children must expect to find difficulties which they will not necessarily have met in their experience of adapting educational methods and schemes to the needs of children whose physical handicaps are restricted to a sensory deprivation or defect or to organic defects, or muscle weakness or paralysis not of cerebral origin. It must be understood that, with cerebral palsy, there are likely to be widespread effects and consequent difficulties which show in other ways than in motor inco-ordination alone. The educational problems which these children present are particularly acute in as much as any special education devised to meet their needs must take into account physical and psychological aspects of the handicap which, in many cases, complicate seriously the educational difficulties which the child presents and which are not easily separable from the mental aspects of the case.

(ii) *Observations on Some Peculiarities Found in the Birth Histcries of Cerebral Palsied Children*

The following observations were made during the course of collecting data on individual children. Though some of the matters touched upon may be thought to be not primarily the concern of educationists, they should not be without interest to them. In so far as certain hazards which children may survive are found to affect their potentialities for education at a later date, the possible influence of these hazards should at any rate be appreciated. It is not intended that some of the data presented should necessarily be taken as conclusive evidence, but rather that they should perhaps draw attention to the need for further research. Though such research may be not essentially " educational," it might provide additional information which would aid those faced with the not inconsiderable task of trying to make some prognostication of the extent to which cerebral palsied children might be expected to profit from certain educational schemes and opportunities offered now or in the future.

(*a*) *Family Position*

The fact that " birth difficulties " are commonly found mentioned in the histories of these children has popularly been associated with an idea that difficulties occur more frequently with first pregnancies and hence that cerebral palsy is more likely to be found among first-born children. In the literature concerned with the birth circumstances of these children there appears to be little evidence mentioned in support of this supposition and, with respect to one possible cause (the rhesus negative factor in the mother), there is definite evidence that second or third pregnancies, rather than the first, are liable to be adversely affected. It is therefore of interest to inquire into the incidence of first-born children among those for whom the necessary data is available.

Among 327 cerebral palsied children (183 boys and 144 girls) the order of birth in their families was found to be as follows :—

TABLE LVIII

Birth Order of 327 Cerebral Palsied Children

Pregnancy	1st	2nd	3rd	4th	5th and later	Total
Incidence	216	57	35	9	10	327
Percentage incidence	66	17	11	3	3	100

It would appear that, at any rate within the limits of the available information, there is some support for the above-mentioned supposition that difficulties are more frequently encountered among the first-born, since two-thirds of the children are the results of first pregnancies. It may next be of interest to inquire whether first-birth incidence shows any variation between the different types of handicap.

The following Table LIX shows the same 327 children grouped according to handicap type and birth order.

TABLE LIX

Birth Order and Cerebral Palsy Type (327 *Children*)

	Pregnancy Order					
Percentage Incidence	1st	2nd	3rd	4th	5th and later	Total
Athetoid	75	11	12.5	—	1.5	100
Spastic	64	19	10	4	3	100
Others	64	22	7	—	7	100

It is difficult to know what, if any, is the particular significance of the rather greater proportion of athetoids (three-quarters) than of the other groups (two-thirds) found to be first-born children, but the evidence is presented as a matter of possible interest since there does not appear to have been previous data published on this question. In any case the preponderance of first-born children is maintained in all categories.

Remarkably few instances appear to be known of cerebral palsy appearing in more than one child in a family and, even when the handicapped child is a twin the other of the pair seems as often as not to have survived and to be without obvious motor handicap. Unfortunately we have insufficient evidence to state with any certainty the proportion, if any, of unhandicapped surviving uniovular twin sibs; we know only for certain that, in some of the cases in which both twins survived, they must have been binovular, being of different sex.

From Table LX it will be seen that rather more than half (58 per cent.) of the 216 children who resulted from first pregnancies remained only children. While it may be argued that, among the youngest in this group, some may not have continued as only children, it is of interest that none of this group were under the age of 5 years when their family position was recorded and most were older. We have insufficient evidence to state in what proportion of cases no younger sibs could be expected either because of (*a*) some physical condition in the mother which would prevent further pregnancies, or, (*b*) a decision by the parents that they would have no more children for fear of producing another handicapped child, or because of their inability to cope with a larger family when one handicapped child needed more than ordinary attention and would continue to require extra care over a long period.

As far as it goes, the evidence offered in Table LX that a little less than half of the 216 first-born children had from 1 to 3 younger normal sibs, i.e., that approximately 38 per cent. only of the whole group of 327 cerebral palsied children whose birth order was noted were both first-born and only children, would tend to bear out the generally accepted theory that the handicap, *in itself*, is not familial (though it remains to be seen whether or not certain predisposing factors may be). The same evidence also, however, bears witness to the fact that many parents are shouldering a heavy burden when, in addition to an eldest handicapped child, they have other younger children to tend. In view of the particular difficulties in early training which the more severely handicapped athetoid children present, it is somewhat surprising to find that, of the three groups, athetoid children come more frequently than those in other categories from families with three or more children, i.e., in which the handicapped child is the eldest and has been followed by two or more sibs.

TABLE LX

Incidence of Younger Sibs in 216 First-born Cerebral Palsied Children's Families

	Number of Siblings					
Percentage Incidence	0	1	2	3	4 or more	Total per cent.
Athetoids	58	21	17	4	—	100
Spastics	57	29	10	4	—	100
Others	67	22	6	5	—	100
All groups ..	58	27	11	4	—	100

(b) Birth and Developmental Difficulties

The pronouncements which American authorities have made from time to time about the number of cerebral palsied children, who, in spite of a relatively serious degree of physical handicap, are intellectually of reasonably normal capacity, have tended to foster much wishful thinking and unwarrantable optimism among many parents regarding their children.

On the other hand if, as has been estimated, there are in fact proportionately a greater number of children to be found in the athetoid category in U.S.A., then there would be a sounder basis perhaps for what would otherwise seem overweighted estimates, from American sources, of normally intelligent cerebral palsied children. This of course is assuming that abnormal conditions limited to the basal area of the brain would have little effect on intellectual capacity, whatever effects they may have on other factors of almost equal importance in determining a child's capacity to profit from training and education.

With regard to the American estimates, another point must not be forgotten. The availability and type of obstetrical services varies enormously between places in different parts of that country. In the cities and larger towns, with ample hospital provision and good medical services, there is apparently a much greater tendency than in this country for drugs and anæsthetics to be used to afford ease to the mother during labour. Such aids, however, in certain cases though giving needed relief to the mother, could conceivably have deleterious effects on the child, particularly when, by the immediate ante-natal stage, there are already present abnormal conditions which may be causing labour difficulties. On the other hand, in America, there are vast areas in which medical and maternity services are either non-existent, or so limited as not to be readily available even in cases of obstetrical difficulty requiring expert skill and knowledge. Should either of these circumstances prevail, it could be expected that there would be a tendency, on the one hand, to a greater incidence of births delayed because of the mother's inertia during labour or, on the other, to existing difficulties being aggravated by lack of the necessary help and attention.

In this country, in spite of the present grave shortage of hospital accommodation and trained midwives, geographical conditions alone are such that in relatively few places would mothers be completely cut off from medical attention should a birth be presenting unusual difficulty. In addition, the relatively rapid expansion during the past few years of ante-natal clinics under the maternity and child welfare services has undoubtedly done much to lessen the difficulties which many mothers would otherwise have experienced had advice and help not been available to them well before they had reached the stage of actual delivery.

Birth histories may also shed some light on the question whether any particular obstetrical difficulties or birth conditions are likely to be followed by general or particular delays in attaining those developmental milestones which are commonly accepted as indications of future rates of progress. It may therefore be of interest to consider briefly the evidence of birth difficulties and abnormalities among those children for whom detailed and reasonably reliable histories were available.

These matters are not of interest to the medical practitioner alone, but may well provide information which would be helpful to teachers both in selecting those children most likely to be able to respond to training and in understanding that slow progress is not necessarily due to lack of effort on the child's part, but may be an inherent factor in a child's handicapping condition.

Among various factors which, from time to time, have been mentioned in connection with the birth histories of cerebral palsied children, prematurity, instrumental delivery and consequent injury, a jaundiced appearance during the first few days or even weeks, asphyxia and convulsions figure most prominently, though actual statistics are rarely given. O'Brien (New York)[50], however, stated that of 134 children with hemiplegia, 50 per cent. had normal obstetrical histories. If we take absence of the above mentioned conditions to constitute " normality," the data available from 127 spastic cases whose birth histories regarding the absence or presence of these factors were as reliable as possible, we find that the percentage of " normal " histories exceeds those quoted by O'Brien, the incidence of " abnormal " features being as follows :—

TABLE LXI (*a*)

Percentage Incidence of Abnormal Features Reported in Births of 127 *Spastic Children*

Prematurity	45 per cent.
Instrumental delivery	29 ,,
Birth injury	10 ,,
Jaundice	15 ,,
Asphyxia	36 ,,
Convulsions	25 ,,

Percentage incidence of these same features among a larger group of 190 C.P. cases of all types was as follows :—

TABLE LXI (*b*)

Percentage Incidence of Abnormal Features in Births of 190 *Cerebral Palsied Children (All Types)*

Prematurity	39 per cent.
Instrumental delivery	30 ,,
Birth injury	14 ,,
Jaundice	19 ,,
Asphyxia	40 ,,
Convulsions	26 ,,

Beyond the fact that the percentage incidence of prematurity is a little lower, and that of birth injury, jaundice and asphyxia a little higher, there is relatively little difference in the proportional incidence of abnormal features given in the data for the two groups. It will be of interest at a later stage to consider some of these factors in relation to the mental development of some of these children, since it may well be that information regarding the absence or presence of such abnormal features would serve as a valuable adjunct to other information in attempting to prognosticate a child's future educability. One interesting point to which it is perhaps worth while drawing attention is the fact that, contrary to the once very general belief that cerebral palsied children were largely " birth injured " children, we find that among all those " abnormal " features listed above, the incidence of " birth injury " is the lowest of all, viz., only 10 per cent. among the 127

" spastic " children and 14 per cent. among the 190 " all types " group. The relatively large percentage incidence of prematurity and asphyxia is also an interesting point, particularly since both of these factors may have far-reaching effects on the general and mental development of the children. O'Brien, incidentally cites an incidence of 33 per cent. of her group (of 134 spastic cases) who showed symptoms of asphyxia at birth ; the incidence in our " spastic " and " all types " groups was in each case a little higher, viz., 36 per cent. and 40 per cent. respectively.

(*iii*) *Abnormal Birth Conditions and Mental Development*

We have considered earlier, in Chapter III, the question of intelligence distribution in relation to type of cerebral palsy handicap and it may now be of interest to inquire further into the matter of differences in the incidence of abnormal birth conditions which at any rate probably contributed to the present physical conditions of the children under discussion. Prematurity, it will be remembered, was found to be a factor in the birth histories of 45 per cent. of a group of 127 " spastic " children and of 39 per cent. of a group of 190 cerebral palsied children of various types ; jaundice in 15 per cent. of the " spastics " and 19 per cent. of the " all types " groups ; asphyxia in 36 per cent. of the " spastic " group and in 40 per cent. of the " mixed types " group ; convulsions within the first few hours in 25 per cent. of the " spastic " group and in 26 per cent. of the " mixed " groups. We have now to see whether there appears to be any marked variation between the distributions of intelligence for those with and those without a history of each of these abnormal birth conditions.

Since, in 18 of the 190 " all types " group, no detailed mental assessment was made, it will be necessary to limit our analysis to the 172 cases for which we have full data. Among this group we find the following percentage incidence of birth abnormalities in the group as a whole.

TABLE LXII

Category	*Percentage Incidence*
Prematurity	35
Jaundice	20
Asphyxia	42
Convulsions	29

It will be observed that, in comparison with the " spastic " group alone, the incidence of prematurity is somewhat lower among this 172 " all types " group, and that of jaundice, asphyxia and convulsions a trifle higher in each case ; the incidence rates, however, accord very closely with those for the 190 children in the " all types " group.

Before taking the various abnormal birth factors for separate consideration, it will be as well to see how this group of 172 children are distributed over the total IQ range irrespective of the presence or absence of abnormal birth features. The general spread of ability is given in the following Table.

TABLE LXIII

Percentage Distribution of Intelligence Among 172 Cerebral Palsied Children

	IQ Range						
	Under 70	70–84	85–99	100–114	115–129	130 and over	Total
Percentage incidence ..	50	16	19	7	5	3	100

This general distribution, compared with that for 468 candidates for a special school given earlier, shows slightly higher proportions in the average and better grades and a correspondingly lower incidence in the lower grades. This is accounted for by the fact that nearly 50 per cent. of these 172 children were those who, after several selection procedures, were accepted as suitable for education and treatment at the special school. Not all, particularly among those in the lower mental categories, were in fact able to be retained after a probationary period of one or two terms. On the whole, however, this group of 172 contains a higher proportion of those of better intelligence than would be found in any unselected group of cerebral palsied children not already attending school. Against an unselected sample of unhandicapped children, of course, even this distribution is markedly weighted in the lower categories and correspondingly light in the average and better grades.

PREMATURITY

If we consider now the incidence of prematurity among these children we find that, out of the 172 cases, 60 were births premature by at least 4 weeks. Distributing the 60 premature and 112 full-term children respectively into 6 broad mental assessment categories, we find the following percentage incidence in the various grades of intelligence.

TABLE LXIV

Comparison of Percentage Incidence of premature and full-term children within IQ ranges. (172)

	IQ Ranges						
Categories	Under 70	70–84	85–99	100–114	115–129	130 and over	Total
Premature	42	17	28	7	6	—	100
Full-term	54	16	14	7	5	4	100

Among the children from whom these data were obtained, the percentage incidence in the lowest grading (IQ under 70) is 12 per cent. lower than that found among those in the full-term category. A possible explanation of this may be that there is a greater tendency for children born with a combination of mental and physical defects to be less able to survive the additional hazards of prematurity and so for those with the greater degrees of double or multiple defects to be short lived, if they survive at all. As regards the somewhat heavier incidence of premature compared with full-term children in the "dull and low average" grade (IQ 85–99), it may well be that the prematurity itself had little to do with this difference in the respective distributions, but that other factors (which may of course have contributed to the cause of prematurity) were such as to produce a slightly higher incidence of dullness. From our sample of 172 cerebral palsied children, of whom 60 were premature, there is therefore no evidence to suggest that, in the case of these children, the prematurity in itself had any "depressing" effect on intelligence.

JAUNDICE

Considering next the factor of jaundice among the same 172 children, this symptom is found recorded in 35 cases, i.e., 20 per cent. of the group. Distributing these 35 and the other 137, in whom the symptom was not observed, into the same mental grades we find the following percentage spread.

TABLE LXV

Comparison of Percentage Incidence of Jaundiced and Other Children within IQ Grades. (172 *cases*)

Categories	IQ Ranges						
	Under 70	70–84	85–99	100–114	115–129	130 and over	Total
Jaundiced	60	11	23	6	0	0	100
"Normal"	47	18	18	7	7	3	100

It will be noticed that, in the distributions of intelligence for children with and without the factor of jaundice, there is a 13 per cent. heavier incidence in the dullest range (IQ under 70), and an absence of children in the superior grades, among those who were jaundiced at birth. We are aware that certain types both of hæmolytic and catarrhal jaundice in the new-born are not uncommon symptoms in children who later show no abnormality. Since, however, in the case of many of the cerebral palsied children, the symptom was associated with a blood incompatibility between mother and child (Rh negative mother), the increased incidence of dullness among these children would appear consistent with the supposition that abnormalities in the prenatal blood supply may have adverse effects on mental development.

ASPHYXIA

Taking next those children with and without a history of asphyxia and making a similar distribution within the IQ ranges, we get the following results :—

TABLE LXVI

Comparison of Percentage Incidence of Children With and Without Symptoms of Asphyxia at Birth. (*172 cases*)

Categories	IQ Ranges						
	Under 70	70–84	85–99	100–114	115–129	130 and over	Total
Asphyxiated	47	13	26	3	7	4	100
Not asphyxiated	52	18	14	10	4	2	100

Here again we observe that there is a lower incidence of those in the IQ ranges under 85 among those with a history of asphyxia, but in general no greater incidence of these children in the ranges above IQ 100 compared with children whose breathing was normal at birth and who were neither cyanozed nor had symptoms of white asphyxia. This observation may suggest that, of all those who would have fallen into the duller grades, a greater number of children who suffered asphyxia than of those who did not failed to survive. There is also to be noted a 12 per cent. greater incidence of asphyxiated children in the dull to low average IQ group (85–99), compared with children without the symptom, and a 7 per cent greater incidence in this grade among those with asphyxia compared with that found in a distribution of the whole undifferentiated group of 172 children. While therefore such evidence as we can present cannot be said obviously to point to respiratory difficulties at birth as necessarily, and in themselves, having any markedly greater an adverse effect on eventual mental development than any other cerebral palsy causing factor, there is some slight indication that a reduction in potential intellectual capacity may be associated with neo-natal anoxia.

CONVULSIONS

The fourth abnormal condition to be considered is the occurrence of convulsions. For our purpose we have taken only those children who exhibited convulsions within the first 72 hours after birth.

TABLE LXVII

Comparison of Percentage Incidence of Children With and Without a History of Convulsions Within the First 72 Post-natal Hours. (*172 cases*)

Categories	IQ Ranges						
	Under 70	70–84	85–99	100–114	115–129	130 and over	Total
Convulsions	64	20	12	2	2	0	100
No convulsions	43	15	22	9	7	0	100

The above distributions appear to indicate that a history of convulsions during the first 72 post-natal hours augurs badly for future mental development, since there is a markedly heavier incidence (84 per cent.) of these children in the lower grades compared with a 58 per cent. incidence of children in whose histories no convulsions are reported at any rate in this early age.

Our observations, on the children in whose histories the abnormal features which have been discussed above were found, would seem to indicate that a poorer level of intellectual development is likely to be found associated with early convulsions; that jaundice (which among cerebral palsied children so often is found with a history of blood incompatibility) tends to show some association with poorer mental development, and that neo-natal asphyxia may possibly have a tendency to " depress " potential intelligence. In addition, two of the factors (prematurity and asphyxia) appear to weed out a greater number of those who would probably have been of poorer capacity had they survived.

A history of convulsions, it should be noted in particular, would appear to have adverse effects on mentality, possibly additional to any resulting from whatever was the prime cause of the cerebral palsy condition. When this symptom is found in a cerebral palsied child's birth history therefore, the chances are more heavily weighted against his eventual educability.

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